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PHYSICAL MEDICINE

Official Journal American Congress of Physical Medicine

(Formerly Archives of Physical Therapy)

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ANNUAL SESSION, NEW YORK CITY, AUGUST 25-29, 1952

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VOLUME XXXIII APRIL, 1952 NO. 4

American Congress of Physical Medicine

30th Annual

Scientific and Clinical Session

and

Instruction Seminar

August 25, 26, 27, 28, 29, 1952

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New York, New York

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INSTRUCTION SEMINAR

In Conjunction with the

30th Annual Scientific and Clinical Session

AMERICAN CONGRESS OF PHYSICAL MEDICINE

August 25, 26, 27, 28, 29, 1952

THE ROOSEVELT **NEW YORK, N. Y.**

TENTATIVE SCHEDULE

MONDAY MORNING — AUGUST 25

(A) 10:00-10:50 A.M. Physiologic Basis of Therapeutic Exercise

(B) 11:00-11:50 A.M. Physiologic Basis of Therapeutic Exercise

MONDAY AFTERNOON — AUGUST 25

(C) 3:00-3:50 P.M. Functional Anatomy of Spine

(D) 4:00-4:50 P.M. Functional Anatomy of Forearm and Hand

TUESDAY MORNING — AUGUST 26

(E) 8:30-9:20 A.M. Present Status (Experimental) of Ultrasonics

WEDNESDAY MORNING — AUGUST 27

(F) 8:30-9:20 A.M. Electromyographic Studies in Poliomyelitis

THURSDAY MORNING — AUGUST 28

(G) 8:30-9:20 A.M. Research Methodology

FRIDAY MORNING — AUGUST 29

(H) 8:30-9:20 A.M. Effects of Age on Physiologic Function and Its Implications in Rehabilitation

MONDAY MORNING — AUGUST 25

(1) 10:00-10:50 A.M. Vocational Counseling

(2) 11:00-11:50 A.M. Back Pain — Problems in Industry

MONDAY AFTERNOON — AUGUST 25

(3) 3:00-3:50 P.M. Treatment of Cerebral Palsy

(4) 4:00-4:50 P.M. Evaluation of Cerebral Palsy Child

TUESDAY MORNING — AUGUST 26

(5) 8:30-9:20 A.M. Modern Upper Extremity Prosthesis and Rehabilitation of Upper Extremity Amputees

WEDNESDAY MORNING — AUGUST 27

(6) 8:30-9:20 A.M. Practical Psychiatric Problems of Which the Physiatrist Should Beware

THURSDAY MORNING — AUGUST 28

(7) 8:30-9:20 A.M. Soft Tissue Splinting of the Upper Extremity

FRIDAY MORNING — AUGUST 29

(8) 8:30-9:20 A.M. Basic Mechanical and Muscular Elements in Pathologic Gaits

Note: The Committee on Education of the American Congress of Physical Medicine is in charge of the instruction seminar. It is purposely planned to limit the subjects in any year to a few topics in order to devote enough time to those subjects to give those attending a good review, both from the standpoint of basic knowledge and from the clinical standpoint. Certain groups of these subjects will be repeated every three to five years.

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ARTHUR L. WATKINS, M.D.

Boston, Massachusetts

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Hospitals, 43 Assistant Residencies and Residencies, 87

Name of Hospital	Location	Chief of Service	Inpatients Treated	Number of Treatments	First Year Residencies Offered*	Total Residencies Offered*	Beginning Stipend (Month)
UNITED STATES ARMY							
Letterman Army Hospital★	San Francisco	R. C. Psaki	3,330	74,961	...	...	.....
Fitzsimons Army Hospital★	Denver	H. B. Luscombe	19,403	258,913	1	4	.....
Army Medical Center★	Washington, D. C.	J. H. Kuitert	6,755	263,456	3	5	.....
VETERANS ADMINISTRATION							
Veterans Admin. Hospital★[1]	Long Beach, Calif.	R. N. Nyquist	10,922	195,816	1	2	.....
†Veterans Admin. Hospital [1]	Fort Logan, Colo.	F. J. Fricke	907	36,326	...	...	.....
Veterans Admin. Hospital	Hines, Ill.	L. B. Newman	5,665	456,711	...	...	.....
Veterans Admin. Hospital [1]	Wadsworth, Kans.	L. Blau	3,169	192,740	...	...	.....
Veterans Admin. Hospital [1]	Framingham, Mass.	F. Friedland	7,000	210,000	1	3	.....
Veterans Admin. Hospital [1]	Jefferson Bks., Mo.	E. H. Weissenb'g	2,215	77,491	1	1	.....
Veterans Admin. Hospital [1]	New York City	A. S. Abramson	13,819	314,026	3	9	.....
Veterans Admin. Hospital [1]	Cleveland	H. T. Zankel	6,414	81,929	1	1	.....
†Veterans Admin. Hospital	Portland, Ore.	E. W. Fowlks	4,954	110,420	1	1	.....
†Veterans Admin. Hospital [1]	Aspinwall, Pa.	S. Machover	2,516	106,131	...	1	.....
Veterans Admin. Hospital★[1]	Houston, Tex.	B. L. Boynton	1,582	6,894	1	1	.....
NONFEDERAL							
Los Angeles County Hospital★[1]	Los Angeles	E. Austin	.....	91,836	...	1	165
White Memorial Hospital★	Los Angeles	F. B. Moor	195	.....	1	1	120
University of Colorado Medical Center Colorado General Hospital★[1]	Denver	H. L. Dinken	2,580	45,876	1	3	75
State of Connecticut Vet. Home & Hosp.	Rocky Hill, Conn.		.....	.....	3	3	.....
Emory University Hospital★	Emory Univ., Ga.	R. L. Bennett	1,719	10,473	1	1	50
Georgia Warm Springs Foundation	Warm Springs, Ga.	R. L. Bennett	972	104,401	1	3	250
Cook County Hospital★[1]	Chicago	D. Kobak	7,501	37,516	...	...	.....
Michael Reese Hospital★[1]	Chicago	C. O. Molander	2,254	19,589	1	1	75
Northwestern University Medical Center	Chicago		13,590	40,962	...	...	.....
Research and Educational Hospitals★[1]	Chicago	H. W. Kendell	5,688	11,769	1	3	55
University of Kansas Medical Center★[1]	Kansas City, Kans.	D. L. Rose	2,456	42,310	1	1	100
Massachusetts General Hospital★	Boston	A. L. Watkins	2,925	31,999	0	9	41.66
University Hospital★	Ann Arbor, Mich.		.....	.....	...	...	.....
University of Minnesota Hospital★[1]	Minneapolis	M. Knapp	20,409	29,436	4	4	.....
Mayo Foundation	Rochester, Minn.	F. H. Krusen	.....	.....	2	6	135
Barnes Hospital★	St. Louis	S. Mead	9,759	9,759	0	1	.....
†Bellevue Hosp., Div. III, N. Y. Univ.★[1]	New York City	H. A. Kusk	4,058	116,705	...	7	80
Coldwater Memorial Hospital★	New York City	M. Dacso	733	50,706	1	2	80
Hospital for Joint Diseases★[1]	New York City	J. Weiss	.....	94,631	1	1	40
Hospital for Special Surgery	New York City	K. G. Hansson	20,806	40,810	1	1	160
Mount Sinai Hospital★[1]	New York City	W. Bierman	11,942	36,979	1	1	50
New York City Hospital★[1]	New York City	F. K. Safford, Jr.	1,138	41,088	1	1	130
†Presbyterian Hospital★[1]	New York City	W. B. Snow	35,865	103,546	1	1	208
St. Luke's Hospital★[1]	New York City	R. Muller	900	98,954	1	1	60
†Rehabilitation Hospital	W. Haverstraw, N. Y.	M. Hoberman	5,868	408,371	1	1	225
Cleveland Clinic Hospital [1]	Cleveland	W. J. Zeiter	17,062	38,475	1	4	.....
Hospital of the University of Pa.★[1]	Philadelphia	G. M. Piersol	1,636	35,639	0	1	.....
Philadelphia General Hospital★[1]	Philadelphia	A. A. Martucci	2,827	23,733	1	1	75
Medical College of Virginia—Hosp. Div.★[1]	Richmond, Va.	W. J. Lee	4,575	40,327	...	...	46.60

The star (★) indicates hospital approved for intern training.
The dagger (†) indicates temporary approval.
[1] Residencies open to women.
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HISTORICAL NOTE

During recent years the view has been widely expressed that an International Congress of Physical Medicine should be held, and at the International Congress on Medical Electronics held in Brussels in 1948, it was suggested that London might be a suitable place for such an event. To this end the British Association of Physical Medicine was informally approached. The Council of this Association felt strongly that such an endeavor should be a regularly recurring event organized by a permanent international body, and undertook to foster the formation of such an international body.

As a preliminary step, the Interim Committee of the International Federation of Physical Medicine was set up in May, 1950, under the Chairmanship of Dr. Frank Krusen, Rochester, Minnesota, U. S. A., with Dr. Svend Clemmesen, Copenhagen, Denmark, as Vice-Chairman. This Interim Committee issued reports on its activities and drafted regulations which were circulated to national Associations of Physical Medicine, with the object of securing international support and the nomination of national representatives. As a result of this Committee's further efforts, membership of the Council for the Co-Ordination of International Congresses of Medical Sciences was secured. Having decided that the first Congress under its auspices would be held in London, the Committee invited the British Association of Physical Medicine, as the national association concerned, to appoint a small committee with powers to form an independent Board of Management responsible for the organization of an International Congress of Physical Medicine in 1952. At the Congress, which will be held in London, a meeting of the national representatives will be called and asked to form the International Committee of Physical Medicine.

ENERGY COSTS OF VARIOUS PHYSICAL ACTIVITIES IN RELATION TO PULMONARY TUBERCULOSIS *

EDWARD E. GORDON, M.D.†

NEW YORK

In the course of management of pulmonary tuberculosis, the question often arises as to how much physical activity a given patient may assume and yet safely avoid stress with possible reactivation of his disease. Precise definition of the limit between tolerance and stress is not possible, for neither are the relevant factors fully understood nor are measurements feasible. However, the intensity of physiological work, i. e., the energy expended in the performance of a task, can be readily obtained. While this method does not reveal the working capacity of an individual, it has the following advantages: (1) the degree of cardiovascular response roughly parallels the intensity of work in terms of energy expenditure; (2) respiratory responses are easily obtained along with the measurement of work intensity. Thus, a rough index of the magnitude of cardio-respiratory stress imposed upon a patient is afforded by a determination of the work intensity of a given task. The intensity of energy expenditure is readily measured in terms of oxygen consumption per minute. On this basis energy costs of some common activities were determined to provide the clinician with a knowledge of their general orders of magnitude. This knowledge could serve as a guide in passing judgment on the wisdom of allowing a patient to engage in a particular activity when apparently indicated on clinical grounds.

Method

As a preliminary investigation to ascertain whether different individuals would display equivalent results in the performance of a given task, mainly healthy subjects were tested. Nine normal female and four normal male subjects were used; as the investigation progressed, four male patients on ambulatory status were included in the study. These exhibited no impairment of pulmonary function and presented the usual bacteriologic and radiologic criteria of apparently arrested disease for four to six months. Such subjects probably afforded values for working energy cost comparable to those for healthy subjects, since they were on an ambulatory status and, consequently, in a better state of physical fitness than clinically active patients. No attempt was made to compare results derived from healthy subjects with those from patients, as the latter comprised too small a group.

Fifty-three experiments were carried out with the normal group and five with patients. Tasks selected were those applicable to patients either on a modified bed-rest program or on limited ambulation. Since the rate of work influences the energy expenditure, it was controlled whenever possible; otherwise the optimum tempo for the individual was allowed. Table 1 lists all experiments on healthy subjects, the modalities tested, materials used, the speed of performance and the working positions assumed. In addition to those experiments listed in Table 1, one patient was used for leather punch-

* "Sponsored by Veterans Administration and published with approval of Chief Medical Director. The statements and conclusions published by the author are a result of his own study and do not necessarily reflect opinion or policy of the Veterans Administration." From Halloran V. A. Hospital, Staten Island New York.

† Formerly Assistant Chief, Physical Medicine Rehabilitation, and Chief, Rehabilitation in Tuberculosis; now Assistant Professor of Clinical Physical Medicine and Rehabilitation, NYU-Bellevue Medical Center; Director, Department of Physical Medicine, Roosevelt Hospital, New York, New York.

TABLE 1. Modalities and Materials Used and Speed of Performance.

Modality	No. of Experiments	Material Used	Speed of Performance	Position of Work
Link Belt	4	Thin grained leather	4 links per 3 min.	In bed
Link Belt	6	Cowhide leather	4 links per 3 min.	In bed
Leather Punching and Lacing	4	Tooling calf leather, 2 or 3 thicknesses, No. 1 Punch	30 holes per 15 min.	In bed
Leather Tooling	4	Tooling calf leather	Optimum speed	In bed
Chip Carving	6	Bass wood, Dexter knife	Optimum speed	In bed
Copper Tooling	8	Copper foil, 36 gauge	Optimum speed	Sitting
Chisel Carving	6	Pine wood	Optimum speed	Sitting
Chisel Carving	6	Gum wood	Optimum speed	Sitting
Hand Loom [1]	4	Pearl cotton #3, warp and weft	Two operations per min.	Sitting
Floor loom [2]	4	Carpet warp Chenille weft	Two operations per min.	Sitting

1. 4-harness structo table loom, 20" reed.
2. 6-treadle, 4-harness Macmott floor loom, 45" reed.

ing and lacing; another for leather tooling. A third patient was also tested while working at a sanding lathe, and one experiment on letter writing was carried out on a normal person while seated at a desk. In addition, it was thought of interest to determine the metabolic costs of showering and the use of a self-propelled wheel chair from bed to lavatory. Four determinations were made in the former instance and three in the latter. The subjects were healthy individuals, except for one patient, who was used in both activities. The temperature of the water for the shower, adjusted to each subject's liking, was judged to be tepid. The rate of wheeling was fixed at 34 ft./sec., or 1.2 m.p.h., on level ground.

The energy requirements were deduced in the usual manner from determination of oxygen consumption. Because of variations in size, age and sex of individuals, energy cost of a particular task was expressed in terms of per cent increase over the basal metabolic expenditure. Therefore, for each experiment two determinations were made, viz., the basal metabolic rate (BMR) and the working metabolic rate. BMR was obtained in the customary manner: with the subject fasting and in the recumbent position for a preliminary period of 30 minutes. By means of a suitable valve arrangement room air was inhaled and the expired air was trapped in a large Douglas bag during an accurately timed period which lasted until a suitable volume of gas was obtained: 70-100 L. The respiratory rate was counted during the collection period for a full minute at three-minute intervals. A ten-minute period of inactivity was then allowed; if a proposed task was to be done in bed, the subject lay propped up on pillows, otherwise he sat quietly in a chair. The one subject tested at the sanding lathe stood at rest for the required time. The signal was then given to start a predetermined task. After two minutes of activity had elapsed, another timed collection of expired

air was carried out, lasting from five to twelve minutes according to the degree of ventilation. Respiratory rate was again counted every two or three minutes. Both volumes of expired air were subsequently measured in a Tissot spirometer, corrected to standard pressure and temperature, and pulmonary minute volumes (PMV) for rest and work derived. Concentrations of CO_2 and O_2 of the expired gases were found with the Haldane gas analyzer.* From these values and the respective PMV, basal and working oxygen consumptions per minute were calculated. Since the rate of oxygen consumption is proportional to the energy production, the energy costs could be deduced from the O_2 consumptions, provided no oxygen debt was incurred during the activity. The intensity of work achieved in all of these experiments was of a low enough order to obviate this feature. The rate of energy cost of a given task was calculated as the per cent increase above basal rate:

$$\% \text{ rise of energy cost} = \frac{\text{working } O_2 \text{ cons./min.} - \text{resting } O_2 \text{ cons./min.}}{\text{resting } O_2 \text{ cons./min.}} \times 100$$

Since respiratory rate and PMV were obtained in the course of each experiment, average tidal volume (volume of each respiration) under basal and working conditions could be calculated.

Results

Energy Cost. — Fig. 1 illustrates the per cent increase in energy cost encountered in normal subjects for four activities tested in a reclining position; for all practical purposes the five average values indicated (22, 24, 27, 39, 45)

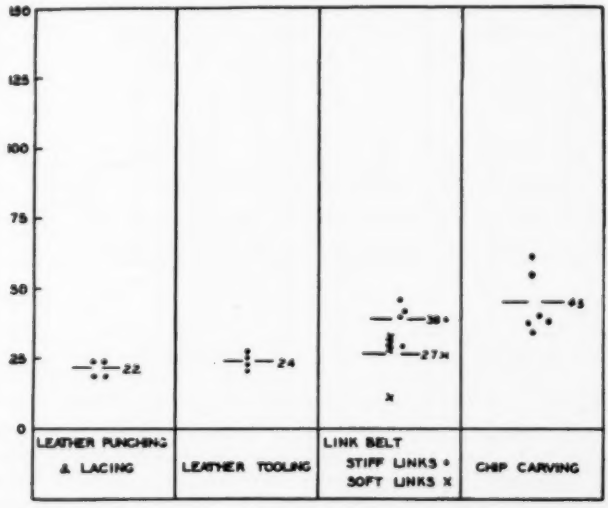

Fig. 1. — Energy cost of activities performed reclining. Ordinates represent per cent increase of working energy cost above basal. Each point represents a different subject. Bars denote mean.

* In later experiments the Scholander apparatus was used.

should be regarded as falling into the same order of magnitude. Of two patients tested, one showed a 22 per cent rise for leather punching and lacing (average for normal subjects —22 per per cent); while another, a 39 per cent rise for leather tooling (average for normal subjects — 24 per cent). The difference between the latter two values may be regarded as of small significance in metabolic terms. The individual variations observed in a given task may, apparently, be attributed to differences in training and neuromuscular tension during work.

Fig. 2 gives the values found in normal subjects for four activities performed in a sitting position. There is a fair degree of agreement between different subjects, except for two observations on chisel carving (173 and

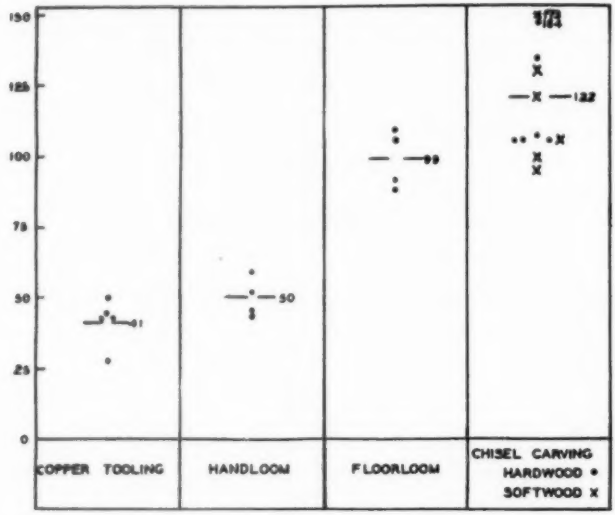

Fig. 2. — Energy cost of activities performed sitting. Ordinates represent per cent increase of working energy cost above basal. Each point represents a different subject. Bars denote mean.

164 per cent) on one individual who was rather tense. It may be pointed out that, since the energy cost of sitting at rest exceeds that of the basal state by 17 to 25,[1-2] copper tooling, hand-loom weaving and chisel carving would require even lower costs, were they done in the reclining position.

Letter writing, tested in one normal subject, yielded a value of 20 per cent rise above basal. This agrees with a rise of 13 and 26 per cent mentioned by Orr and Leitch; the value of 75 per cent given by data published by the Harvard Fatigue Lab. appears excessive.[1] The one experiment on the sanding lathe presented an increase in energy expenditure of 119 per cent above basal.

1. Laboratory Manual of Field Methods for Biochemical Assessment of Metabolic and Nutritional Conditions. Harvard Fatigue Laboratory, March, 1946.
2. Orr, J. B., and Leitch, I.: Nutrition Abstracts and Reviews, 1937-38, 7:509.

The results of experiments on energy cost for showering were of some surprise, since the range of metabolic work was found to be rather high (see Table 2). The lowest value was displayed by the one patient included

TABLE 2. — *Per Cent Increase of Energy Cost of Activities Over Basal.*

Subject	Showering	Self-Propulsion in Wheel Chair
1*	242	138
2**	301	137
3**	377	134
4**	350	.....

* Patient.
** Normal Subjects.

in this group; he was more deliberate in his actions. In spite of these apparently marked variations (from 242 to 377 per cent), the values may be considered to show a good correspondence, when the difference in habit patterns between individuals is taken into account. The level of physiological work involved in self-locomotion in a wheel chair was also found to be higher than that which would ordinarily be surmised (see Table 2).

Pulmonary Minute Volume. — Activities up to 170 per cent rise in working O_2 consumption were plotted against the corresponding per cent rise in PMV and an average line drawn through the points. This relationship is presented in Fig. 3. In general, it is obvious that there is a rough proportionality between energy expenditure and ventilation, the upper portions of the

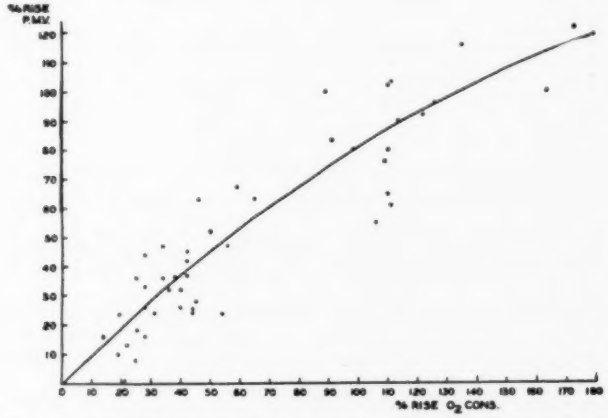

Fig. 3. — Relationship between increments in working energy cost and pulmonary minute volume. For lower increments of energy cost the slope of the curve is about 1; for higher increments, about 0.67.

curve tending to flatten slightly, so that the ratio of ordinate to abscissa in this range was found to be about 0.67. Values with high energy costs, such as those derived from the four experiments on showering, conformed, approximately, to this relationship, viz., the ratios of per cent rise of PMV to per cent rise of O_2 consumption being 0.67, 0.70, 0.83, 0.59. Therefore, it would appear that the water itself produced no reflex stimulation of respiration, probably because the temperature was mild, and that the activity associated

with showering was solely responsible for the observed physiological effects.

Tidal Volume. — In the field of pulmonary tuberculosis it is likely that PMV may not be the best index of respiratory stress in terms of local organ disease. Even if the energy cost of an activity is relatively low the rise in PMV, though small, may be almost entirely due to increase in depth of respiration; a critical point may be exceeded at which stretching aggravates a lesion such as a cavity or an endobronchial ulceration. Hence the effect of work on ventilation was extended to include studies on depth of respiration, with tidal volumes used as an index.

In Fig. 4 the per cent increase in O_2 consumption has been plotted against the corresponding per cent increase in tidal volume. It will be noted that three-quarters of the experiments yielding an energy cost of 65 per cent or less showed only a small increment (up to 20 per cent), no change, or a decrease in tidal volume; practically all activities with costs higher than 65

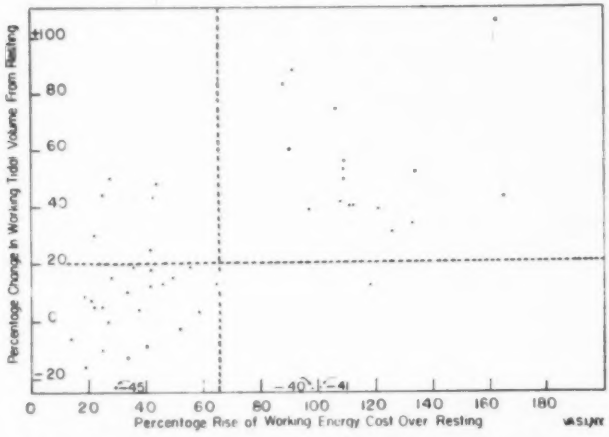

Fig. 4. — Relationship between increments in working energy cost and tidal volume. The dotted line projected from 65 per cent on the abscissa includes most of the points indicating a fall, no change, or a small rise in tidal volume, i. e., 20 per cent in working tidal volume. Large increases in tidal volume are associated with large increases in energy cost.

per cent displayed larger rises in tidal volume (over 20 per cent). Thus, in the former instance, the rise in PMV is attributable mainly to increase in respiratory rate. The significance of this finding will be further discussed.

Discussion

It is emphasized that this work is concerned only with the intensity of the rates of energy cost of various activities and not with the total sum of daily energy expenditure. It is believed that the factor of intensity is fully as important as the total sum, since a short burst of relatively high energy cost may be injurious to the tuberculous patient by exceeding a certain critical level above which physiological stress may cause pathologic changes. For example, a physician rightly hesitates to allow showering for some patients still in a dubious clinical status; the four or five minutes required to perform the activity contributes an insignificant amount to the total daily expenditure, yet the relatively high intensity of physiological stress engendered even

for a short time casts doubt on the wisdom of allowing it. In this light, a knowledge of the intensity levels of energy costs may help contribute to the final judgment regarding the prescription of certain activities for a patient. Therefore, a compilation of energy costs is presented, in which have been utilized both observations from these experiments and those reported in the literature.* In Table 3 are grouped values for activities of daily living and for work therapy.†

TABLE 3. — *Energy Cost of Self-Care and Work Activities.*

Activities	% Rise	Source
Sitting	17–25	Harvard Fatigue Lab. (1), Orr (2)
Standing relaxed	38	Harvard Fatigue Lab.
Conversation	38	Harvard Fatigue Lab.
Dressing and undressing	43–53	Sherman (3) Brody, et al. (2)
Personal toilet	38	Harvard Fatigue Lab.
Showering	242–377	Author
Eating a meal	38	Harvard Fatigue Lab.
Writing a letter	75	Harvard Fatigue Lab.
	20	Author, Kestner, et al. (2)
Strolling	75	Harvard Fatigue Lab.
Walking slowly (2.6 m.p.h.)	160	Sherman
Using wheel chair (1.2 m.p.h.)	138	Author
Walking moderately fast (3.75 m.p.h.)	290	Sherman
Walking downstairs	320	Sherman
Walking upstairs	1330	Sherman
Hand sewing	40	Sherman
Knitting (23 stitches/min., sweater)	50	Sherman
Making link belt (reclining):		
stiff leather (4 links/3 min.)	39	Author
soft leather (4 links/3 min.)	27	Author
Leather tooling (reclining)	24	Author
Leather punching and lacing (reclining)	22	Author
Chip carving (reclining)	45	Author
Copper tooling (sitting)	41	Author
Weaving — hand loom (2 operations/min.)	50	Author
Weaving — floor loom (2 operations/min.)	99	Author
Chisel carving (sitting)	122	Author
Tailoring	75–105	Sherman, Farkas, et al. (2)
Typing	20–50	Kestner, et al. (2)
Typing rapidly	82	Sherman
Bookbinding, light	56–92	Kestner, et al. (2)
Bookbinding, partly heavy	105–120	Sherman, Kestner, et al.
Wood work on sanding lathe	119	Author

The levels of energy cost assigned to the various activities studied may err on the low side. In the first place, a majority of the subjects were normal, healthy individuals, all of whom were trained in the tasks performed. This combination of factors might have operated to give results lower than those possibly attained by patients newly assigned to some sort of physical activity. However, since work is contraindicated for acutely ill patients, and since the tasks utilized can be quickly learned, it is probable that the patients ready for some activity would closely approximate the values obtained in this study.

A second possible source of error may stem from the oxygen debt incurred during activities of relatively high energy cost. Occurrence of an oxy-

* Values from the literature have been recalculated in terms of per cent rise of energy cost above basal. To calculate back to total working energy cost per hour, assuming a "mean man" of 1.77 sq. m. with a BMR of 77 cal./hr.:

$$\text{Working cal./hr.} = \text{BMR}\left(\frac{\%\ \text{rise}}{100} - 1\right)$$

† Harvard Fatigue Lab. data are partly original and partly compiled from other sources.

3. Sherman, H. C.: Chemistry of Food and Nutrition, New York, Macmillan Co., 1956, 7 ed., p. 189.

gen debt would be expected to yield falsely low values, inasmuch as post-activity recovery periods were not studied. However, none of the activities performed is of great enough intensity to produce a significant oxygen debt.

It may be noted from Table 3 that showering is a high energy cost activity comparable, at least, to walking 3.75 m.p.r. or walking downstairs. The conclusion as applied to bed-rest patients is obvious. Again, a patient who believes that he obviates the stress of walking by propelling himself in a wheel chair can be quickly disenchanted by being shown that, for all practical purposes, he is walking at about 2 m.p.h. It is pointed out, in passing, that climbing stairs is an extremely arduous activity. On the other hand, many of the occupational interests impose minimal demands, especially if they can be undertaken with the patient comfortably propped up in bed. The small physiological activity that they would entail may be more than balanced by the release of mental tension and, consequently, achievement of more nearly complete rest during the remainder of the day.

The presentation of tables of energy cost should not be interpreted to mean the advocacy of prescription for activity in precise dosages. This procedure is neither attainable nor desirable. Rather, it is hoped that on the basis of a rough approximation of the physiological stress sustained in doing a given activity, the patient and physician will be on surer ground. From a practical point of view, choice of activities may be contained within physiologically meaningful limits.

These limits with respect to pulmonary tuberculosis have already been suggested from the analysis of the effects on tidal volume. It is apparent from Fig. 4 that those tasks showing low levels of energy cost (up to 65 per cent) have little or no effect upon tidal volume. From the point of view of local organ pathology, therefore, it appears that patients on bed rest probably would be subjected to little additional respiratory stress while engaged in activities within the limits of 65 per cent when clinically indicated. On the other hand, tasks associated with higher levels of energy cost produce a larger increase in tidal volume and may be reserved for patients on an ambulatory status. Thus, the boundary between minimal and moderate stress is suggested on physiological grounds rather than arbitrarily. However, further work along these lines is indicated, both in substantiating these findings and investigating the influence of bodily position upon tidal volume during activity. A more complete assessment of local organ stress during work would demand also a knowledge of changes in hemodynamics of the pulmonary vascular bed.

It is emphasized that selection of activities on the basis just described is applicable only to individuals with little or no impairment of pulmonary function (and cardiac reserve). In those with lowered function due to fibrosis or surgical procedures, moderate increases of pulmonary ventilation may spell frank dyspnea. Tidal volume will also rise beyond the level predicted for subjects with normal pulmonary function, because of lowered ventilatory reserve. These implications of lowered respiratory function deserve further study to establish that level of energy cost which is compatible with pulmonary (and cardiac) functional capacity.

Summary and Conclusions

1. Preliminary experiments have been made mainly on healthy subjects to determine the energy costs for several occupational and daily living activities in terms of oxygen consumption. A table of rates of energy cost has been compiled from this work and the literature to serve as an index of the

order of magnitude of the physiological stress entailed in various activities.

2. It has been found that activities of low energy cost (up to 65 per cent) were usually associated with disproportionately small changes in tidal volume. This finding may be of practical significance in the management of patients on bed rest, since it suggests that the danger of mechanical stress upon the lung may be minimal within this range of work intensity.

Discussion

Dr. B. B. Bagby, Jr. (Oteen, N. C.): I first would like to compliment Dr. Gordon for presenting such an interesting and timely subject and one which is so vitally needed for those of us dealing with the rehabilitation of the tuberculous. I feel that his work is very basic in its concept and that he has made a very creditable step toward giving us something tangible in the direction of the energy requirements in various activities. The one great difficulty in such a program and in such figures is, unfortunately, the difficulty of evaluating the energy cost of an individual. As Dr. Gordon has pointed out, the necessary individual energy costs of different persons vary so much in that the more skilled an individual is in a given activity the less the energy cost.

In applying this to tuberculosis patients, this problem becomes even more pronounced since it is definitely shown by a number of people that the mental attitude of the patient determines greatly his approach to activity.

I think it is also important that Dr. Gordon's study of stress is to be considered much further because it has been our experience in the Rehabilitation Center, V. A. Hospital, Oteen, North Carolina, based on some 1800 discharges in the last 4½ years, that the patient who has a routine program — one in which his mode of living and his vocational endeavor have no marked peak but more or less run on a level or rolling type of activity, does much better than the patient whose life and vocation calls for spurts and peak demands for activity. We have also found that the patient who has a definite routine — that is, goes to school or steady work rather than working only spasmodically, has a noticeably better record insofar as the reactivation of their disease is concerned. I am sure that all will profit by Dr. Gordon's tests. His work should be expanded and further studies made for the benefit of all.

EFFECT OF CONTRAST BATHS ON THE VASOMOTOR RESPONSE OF RHEUMATOID ARTHRITIS PATIENTS *

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Although changes in the peripheral circulation of patients with rheumatoid arthritis have been noted frequently, these changes have not been sufficiently constant so that a specific vasomotor picture could be associated with this disease. Most commonly noted has been a decrease in the cutaneous temperature of the fingers.[1-4] Ghormley and Silverglade,[5] however, found considerable variation in the skin temperatures of both normal individuals and patients with rheumatoid arthritis.

As far as vasomotor response was concerned, Martin[6] and his co-workers found that there was no constant defect in the peripheral circulatory adaptability in rheumatoid arthritis, though the response to warmth after a period of cooling was slow and irregular.

Wright and Pemberton[1] found that on exposure to cold the cutaneous temperature decreased more in the normal individual than in the patient with rheumatoid arthritis. Woodmansey[3] noted that after exposure of an extremity to water at a temperature of 15 degrees C. for one minute, the return of cutaneous temperature to control values was often slower in the rheumatoid arthritic than in the normal.

Similar observations were made by Naide,[7-8] who concluded that these patients showed a high degree of vascular tone. Steinbrocker and Samuels,[4] using such indices as oscillometric readings, temperature and color change of skin, found that approximately 50 per cent of the rheumatoid arthritis patients showed evidence of arteriolar vasospasm.

Contrast baths have long been used to provide symptomatic improvement

* Read at the Twenty-Ninth Annual Session of the American Congress of Physical Medicine, Denver, Colorado, September 5, 1951.
* Abridgement of a thesis submitted by Dr. Fricke to the Faculty of the Graduate School, University of Colorado, in partial fulfilment of the requirements for the degree of Master of Science in Physical Medicine and Rehabilitation.
* Published with permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or conclusions drawn by the authors.
** The paper was written while Dr. Fricke was a resident at Fort Logan VA Hospital. He is now Chief, Physical Medicine Rehabilitation Service, Veterans Administration Hospital, Omaha, Nebr.

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7. Naide, Meyer: A Test for Vascular Tone in Humans and Its Application to the Study of Vascular Diseases with Special Reference to the Etiology and Prevention of Thrombophlebitis, Am. Jour. Med. Sciences 207:606 (May) 1944.
8. Naide, Meyer; Sayen, Ann, and Comroe, Bernard I.: Characteristic Vascular Pattern in Patients with Rheumatoid Arthritis, Arch. Int. Med. 76:139, 1945.

in joint disease,[9] though there is no evidence that they produce permanent circulatory improvement.[10]

The purpose of this study was to determine the peripheral vascular response of the rheumatoid arthritic to cold, and to note what effect contrast baths might have on these reactions.

Methods

Cutaneous temperature of the dorsum of the third finger just proximal to the nail was taken by means of a thermistor. Room and cutaneous temperature were recorded every five minutes until the cutaneous temperature was fairly constant. The entire hand was then immersed in cold water at 15 C. for one minute. After removal of the hand from the cold water the cutaneous temperature was recorded every minute for five minutes, and then every two and one-half minutes until the control level had been reached or approximated.

The rate of return of cutaneous temperature to the control level was represented as 100 times the ratio of the rise in skin temperature after removal from the cold water to the fall in cutaneous temperature on immersion in cold water. For example, if the skin temperature fell from 33 C. to 23 C. on immersion in cold water, and rose to 30 C. five minutes after removal from the cold water this would be referred to as a 70 per cent return in five minutes.

Ten patients with rheumatoid arthritis were studied, in which, after the control reaction to the test stimulus was recorded, there was daily treatment with contrast baths for periods up to five weeks. The schedule followed was hot water (110 F.) for ten minutes, cold water (60 F.) for one minute, then alternating hot and cold for four minutes and one minute, respectively, until the total time of treatment was thirty minutes. At weekly intervals the reaction to the cold stimulus of 15 C. for one minute was tested. All of these patients had involvement of the hands. The average age of this group was 49 years, with a range from 27 to 69 years.

In ten "normal" subjects, without any clinical evidence of arthritis or peripheral vascular disease, the reaction to the cold stimulus (15 C. for one minute) was tested. The average age of this group was 35 years, with a range from 23 to 54 years.

Results

Normal Subjects: These experiments were performed at an average room temperature of 24.4 C., with a range from 23.4 to 25.3. This range applied to the entire group, and not to any one experiment, in which the fluctuation was usually within 1 C. The mean control cutaneous temperature was 33.3 C. Immediately after one minute of immersion of the hand in cold water at 15 C., there was an average decline in cutaneous temperature of 8.3 C. ($\pm$0.5 C.)* (figure 1). Five minutes after removal of the hand from the cold water, the cutaneous temperature had returned 71 per cent ($\pm$5.4 per cent) toward the control levels, while after ten minutes the return was 88 per cent ($\pm$3.4 per cent).

Rheumatoid Arthritis Subjects: Ten patients were treated with contrast baths. The mean room temperature at which these experiments were performed

9. Comroe, Bernard I.: Arthritis and Allied Conditions, Lea & Febiger, Philadelphia, 1944, p. 247.
10. Hines, E. A., Jr., and Kvale, W. F.: Circulation: Effects of Heat and Cold, Exercise and Posture, in: Glasser, O.: Medical Physics, Chicago, The Yearbook Publishers, Inc., 1944, pp. 194-206.
* Standard error of the mean.

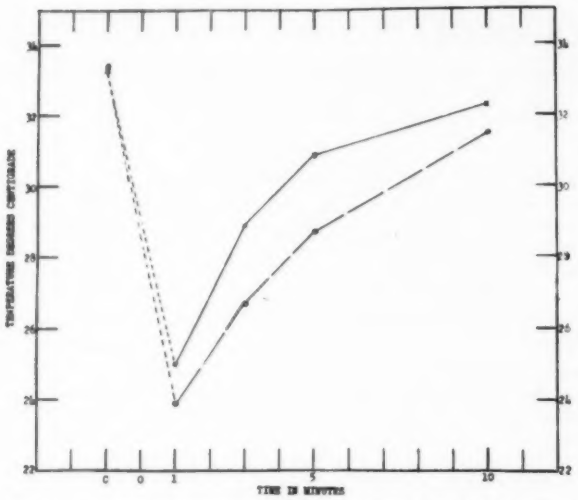

Fig. 1. — The effect on cutaneous temperature of immersion of the hand in water at 15 degrees C. for one minute. On the abscissa, C represents the average control cutaneous temperature and O the time of removal of the hand from the cold water. The solid line represents the temperature of the controls and the broken line the temperature of the rheumatoid arthritis patients.

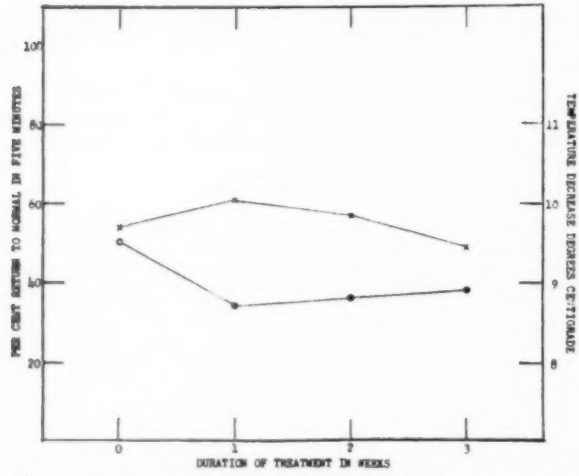

Fig. 2. — The effect of contrast baths in the rheumatoid arthritis patient on the decrease in cutaneous temperature following immersion of the hand in cold water and on the rate of return of cutaneous temperature towards normal following removal of the hand from the cold water. The open circles represent the decline of cutaneous temperature while the crosses represent the percentage return of cutaneous temperature to normal five minutes after removal of the hand from cold water.

was 24.7 C., with a range from 24.1 to 25.4 C. The average cutaneous temperature before immersion in cold water was 33.4 C., approximately the same as the control temperature in the normal subjects. Immediately after one minute of immersion of the hand in cold water, there was an average decrease in cutaneous temperature of 9.5 C. (±0.16 C.), (figure 1). This decline in temperature was significantly greater ('p' value 0.02) than the decline in cutaneous temperature of the normal subjects on exposure to cold. The rate of return of the cutaneous temperature to normal levels was significantly slower than in the normal subjects. Five minutes after removal of the extremity from the cold water, the cutaneous temperature had returned 51 per cent (±5.2 per cent) toward control levels while after ten minutes the return was 80 per cent (±3.7 per cent). The return at five minutes was significantly slower in the patient with rheumatoid arthritis than in the normal subject, with 'p' value for the difference of 0.01 (20 per cent).

After control levels for the magnitude of decline in cutaneous temperature on exposure to cold, and for the rate of return to normal on removal from cold had been established (at least four observations on each subject, with a total of 41 control observations) the patients were treated with contrast baths. The degree of decline in cutaneous temperature on immersion in cold water was significantly reduced by contrast baths (figure 2), though it was still somewhat greater at the end of three weeks of treatment than it was in the normal subject. The average decrease in skin temperature on cold exposure during the period of contrast bath therapy was 8.8 C. This decline was 0.7 C. (±0.22 C.) smaller than the decrease before contrast baths had been begun, significant at approximately the 0.5 per cent level of confidence. As seen in figure 2, the change in response to cold occurred within the first week of contrast bath therapy, and remained at approximately the same level during the remainder of the period of treatment.

The rate of return of the cutaneous temperature to normal was not significantly altered by the contrast baths (figure 2).* If anything, there seemed to be a slower rate of return to normal as the treatment was continued.

Preliminary observations made on 8 patients with rheumatoid arthritis suggested that the decrease in the fall in skin temperature on exposure to cold during the contrast bath therapy was specifically the result of the alternation of hot and cold. In 4 patients the reaction to the cold stimulus was studied before and after a period of daily treatment of the hands with water at 110 F. for twenty-six minutes, while the 4 other patients were studied before and after daily treatment of the hands at 60 F. for four minutes. The periods used were the same as the total time at each temperature in the contrast baths. In the group treated with warm water, the mean decline in cutaneous temperature before therapy was 9.3 C., while after one and two weeks of treatment it was 9.4 C. In the other group the mean control fall in skin temperature was 9.2 C., while after one and two weeks of cold water therapy it was 9.0 C. Neither change was a significant one.

Comment

Most previous workers have found a lower cutaneous temperature in rheumatoid arthritis patients than in normal individuals. This was not demonstrated by our experiments. The average initial cutaneous temperature

* The control level of 54 per cent is different from the control level of 51 per cent noted previously because 3 patients whose control levels were taken did not receive contrast baths. The 51 per cent figure refers to all patients tested, while the 54 per cent figure refers only to those who received treatment and were followed for 3 weeks.

of the rheumatoid arthritis patients was 33.4 C. as compared with a cutaneous temperature of 33.3 C. in the controls. These studies indicate that, on prolonged exposure to an ambient temperature of approximately 24.5 to 25.0 C., the patient with rheumatoid arthritis can have as great a cutaneous vasodilatation as the normal subject. With a cold stimulus, however, the decline in cutaneous temperature is definitely greater in the rheumatoid arthritis patient (9.5 C.) than in the normal control (8.3 C.). This is illustrated by the scatter diagram (figure 3). Ninety-six per cent of the arthritic patients had a decrease in cutaneous temperature greater than 8 C. in response to the cold stimulus, while only 60 per cent of the normal subjects had a fall in skin temperature greater than 8 C. in response to the same stimulus. This finding confirms the observations of most other workers.

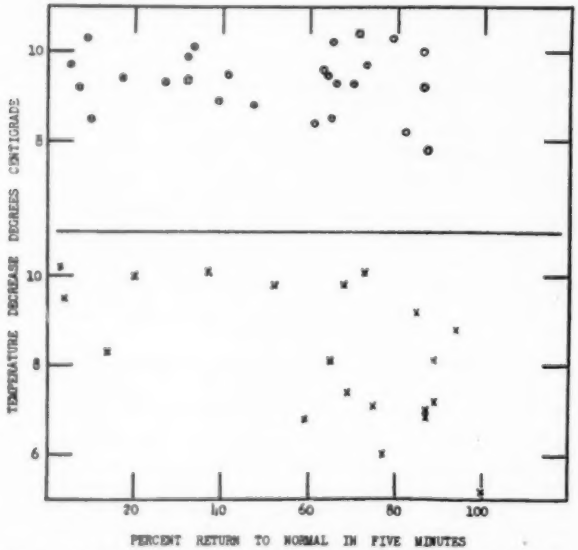

Fig. 3. — Scatter diagram relating the magnitude of fall in cutaneous temperature on immersion of the hand in cold water to the rate of return of cutaneous temperature towards normal following removal from the cold water. The crosses refer to the normal individuals, the open circles to the rheumatoid arthritis patients.

The local vasoconstriction following the application of cold is partly the result of a direct effect on the arteriolar musculature, and partly the result of reflex effects. These studies do not indicate which of these (or both, possibly) is primarily responsible for the unusual sensitivity of the patient with rheumatoid arthritis to the cold stimulus.

Not only is the vasoconstriction following cold more marked in the rheumatoid arthritis patient, but it is also more prolonged, as shown by the slower return towards normal after removal of the extremity from the cold water. In figure 3, it is noted that 75 per cent of the normal subjects had a 50 per cent or greater return to the control level within five minutes, while only 54 per cent of the rheumatoid arthritics had a similar return.

Contrast baths given to the hands of the rheumatoid arthritis patients cause significant changes in the amount of vasoconstriction of the small ves-

sels in the fingers following cold stimulation. This was evidenced by a significant decrease in the fall of the cutaneous temperature of the fingers following immersion in cold water. This decrease in response to cold was already present after one week of contrast bath therapy and remained at this level during the remainder of the period of therapy. It is strongly suggested that the active alternate contraction and relaxation of the smooth muscle of the arteriole was the important factor in causing this change. It is interesting to note that the sensitivity to cold, as evidenced by fall in cutaneous temperature, was decreased by contrast bath therapy, whereas the subsequent slow response to a room temperature of approximately 25 C. was unaltered. The lack of relation between these two phenomena — degree of fall in cutaneous temperature and rate of return to normal — is further illustrated by the scatter diagram (figure 3) of the arthritic patients. The magnitude of decline in skin temperature was as great in the patients who had a rapid return to normal as it was in those with a slower return.

There did not appear to be any correlation between the decrease in the cutaneous temperature or the rate of return to normal of the cutaneous temperature following cold stimulation and the clinical condition of the patient. This finding appears to be similar to that of most other investigators in this field. The majority of the patients received no remarkable relief clinically from the contrast bath treatments.

Summary

1. At a room temperature of approximately 24.5 to 25.0 C. the average cutaneous temperature of rheumatoid arthritis patients was the same as that of a group of normal controls.

2. The decrease in cutaneous temperature following immersion of the hand in cold water at 15 C. for one minute was greater in the arthritis patients than in the controls, while the rate of return of skin temperature to the pre-cooling level was slower in the arthritis patients.

3. Contrast baths to the hands, in patients with rheumatoid arthritis, significantly decreased the fall in cutaneous temperature following a cold stimulus, but it did not appreciably change the rate of return of the cutaneous temperature to the pre-cooling levels.

Discussion

Dr. Jesse G. Jenkins (Temple, Texas): I wish to congratulate Dr. Fricke on his paper and the work that he has done. He has spent a good deal of energy and time in doing the work he has accomplished.

M. M. Ernst and D. H. Collins made the following observations: "Poor reaction to contrast baths appears associated with the more severe and acute states of rheumatoid arthritis. We have never encountered a poor reaction in healthy males. Rather do we believe that the sluggish adaptability of the peripheral circulation in severe cases of rheumatoid arthritis in men is a consequence of the disease.

"Females without any arthritis and apparently in good health fail to react in an adequate manner to the contrast bath tests. In females who have rheumatoid arthritis the poor reactions may be due to the vascular dysfunction and not to rheumatoid arthritis."

Collins' data make it certain that the preexistence of vascular defects, although they may favor a graver form of the disease and be prejudicial to its recovery, is not an essential factor in the onset and development of rheumatoid arthritis in either sex.

Lewis noticed that the palmar tips of the thumb responded more rapidly to the heat than did the dorsal surface. This may be attributed to the greater number of arteriovenous anastomoses in the palmar surfaces, which augment and curtail the blood flow. Collins does not believe that a vascular disorder is the primary cause of rheumatoid arthritis. Infection still appears to be the primary cause.

With the work we have done at the Scott and White Hospital Clinic and at Temple we have been more or less in the field of treating patients, and have not gone into the field of experimental work or testing out in this particular line. We have used contrast baths in the treatment of rheumatoid arthritis, using hot water at 42 C., 107.6 F., and the cold water at 12.5 C. or at 53.6 F., and it appears that sometimes these

patients receive some benefit from the standpoint of taking care of the pain at the time. In other cases the pain was made more severe, and they were unable to stand it.

These baths were advised for patients who went out. In our clinic we are not able to keep the patients over a long period of time, it being a private clinic. We go out to the homes in the various parts of the country. On some we get later reports, but on others we do not, and for that reason I am not able at this time to give any definite figures on what results we are getting from rheumatoid arthritis treatment in the form of contrast baths.

With some patients, contrast baths with a spray are used. By this spray method we find that six minutes in hot water and four minutes in cold water has proved to be about the most satisfactory timing, and the use of a spray over the affected part with hot water, switching to a spray with cold water sometimes makes it better and more convenient for the patients when they have tubs at which they can connect the hose. Others we ask to simply immerse their hands in two tubs, one with hot water and one with cold.

Dr. Harry Samberg (Des Moines, Ia.): I think one of the important points in this connection, since physical medicine has to go through a great many forms of investigation, namely, the importance of this question, is not so much how much decrease there is, but what the end result is over a period of treatment.

Dr. Fred J. Fricke (Fort Logan, Colo., closing): I might make one statement in regard to the clinical aspect of this as a clinical response from this treatment:

Out of the ten patients we tested and on whom we ran contrast bath treatments, there was one that had remarkable results subjectively, other than the results you saw on the tables. Two others fe't that they had some improvement, but the rest of them did not feel their hands were any better or felt any different after the contrast bath treatment.

IMPORTANT NOTICE

Nominations of candidates for Gold Key Awards may be made by any member of the Congress. A nomination should include a brief statement of the achievements of the candidate and the reasons for his consideration by the committee appointed to select the recipients of the award. Nominations should be sent to the Executive Secretary of the American Congress of Physical Medicine by May 1, 1952.

ELECTROMYOGRAPHIC RECORDING OF MUSCULAR ACTIVITY IN NORMAL AND SPASTIC GAITS *

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and

MORTON NATHANSON, M.D.

NEW YORK

Approximately 75 per cent of the 250 patients examined at the Multiple Sclerosis Research Clinic of the New York University-Bellevue Medical Center had gait disorders primarily due to spasticity. This fact alone demonstrates the importance of spasticity as a disabling factor. Its presence in many of the chronic neurologic disorders makes spasticity a great challenge to rehabilitation. Braces and canes frequently improve the spastic gait but only to a limited degree. Other therapeutic measures such as drugs, exercise and surgery have been employed extensively to improve the walking ability of these patients. Their effectiveness is questionable.

Actually, the criteria for judging the effect of any of these therapeutic methods are for the most part based on subjective evidence. In order to evaluate more objectively the effect of therapy on spastic gaits, the pattern of muscular function during ambulation was studied. This was done by recording the electric activity of the important muscle groups involved in walking, employing a method similar to that used at the University of California.[1]

Method and Material

Small skin electrodes (metal discs of ¾ inch diameter) were applied with adhesive tape over the muscles to be examined. Thin wires connected these electrodes to a channeling box which the subject carried on his back. A ten foot cable connected the box with the recording machine, a Medcraft 8-channel ink-writing oscillograph (Fig. 1). This arrangement allowed the subject to walk freely back and forth for a distance of 20 feet. Two microswitches attached to the sole of the shoe produced signals which demarcated the swing and the stance phase (Fig. 2). These signals were recorded in one channel of the oscillograph. The other channels recorded the electric activity of the seven major muscle groups of the lower extremity. A preliminary study showed complete synchronism in the contraction of all muscles of the same group during walking. Therefore, only one muscle was chosen from each group for recording of action potentials in the following way:

1. Hip extensor group: gluteus maximus; 2, hip abductor group; gluteus medius; 3, hip adductor group: adductor longus; 4, knee flexor group: semitendinosus; 5, knee extensor group; vastus lateralis; 6, calf muscles; inner head of gastrocnemius; 7, pretibial muscles: tibialis anticus.

Since the mechanical effect of muscular contractions coincides, for all practical purposes, with the electric activity in the contracting muscle, the electromyogram allows us to analyze the pattern of muscular activity.

* From the Departments of Neurology and Physical Medicine and Rehabilitation, New York University College of Medicine. Supported by a grant from the National Multiple Sclerosis Society.
* Read at the Twenty-Ninth Annual Session of the American Congress of Physical Medicine, Denver, Colo., September 7, 1951.

1. University of California: Prosthetic Devices Research, vol. 1, chap. 3, 1947.

Fig. 1. — Technique of electromyographic recording. — The muscle action potentials are picked up by metal electrodes which are attached to the skin over the muscle with adhesive tape. Thin wires connect these electrodes with a channeling box. The latter is connected to the recording machine by a ten foot cable. Thus, the patient can walk freely for a distance of 20 feet.

Fifteen normal subjects, eleven hemiplegics, and thirty-six patients with spastic paraparesis were studied. The etiology was cerebro-vascular accident in the cases of hemiplegia, and multiple sclerosis in the paraparetics. The subjects walked on level ground in their usual manner. Recordings of the gait in each subject were made repeatedly at varying intervals in order to determine and verify the basic patterns. In some of the paretic subjects comparative electromyograms of gait with and without cane or short leg brace were taken. Several patients had electromyograms before and after intravenous injections of amobarbital sodium (Amytal[R] Sodium) (2 to 3 grains in 2 minutes) or mephenesin (Tolserol[R]) (50 cc. of a 2 per cent solution). One patient had electromyographic gait studies before and after obturator neurectomy. The effects of exercise and massage were also studied.

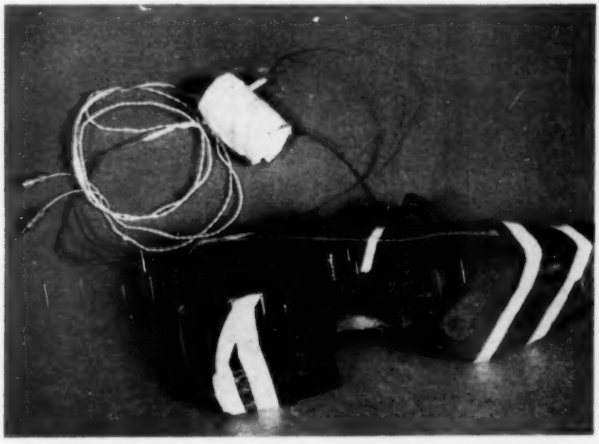

Fig. 2. — Recording of stance and swing phase. — Micro-switches attached to the sole and heel of the shoe are connected to one channel of the oscillograph where they produce a signal at the beginning and at the end of the stance phase.

Results

Normal Subjects. — In the normal subjects a consistent pattern of electric activity was found (Fig. 3). Only one muscle group, the calf muscles, started to contract in the middle of the stance phase. This group was the most active one in the normal gait as shown by the high amplitude of its tracing. Six muscle groups, including the hip muscles, the quadriceps, and the hamstrings, showed electric activity during the transition from swing to stance phase. Of these muscles only the gluteus medius continued to contract beyond the middle of the stance phase. The others ceased contracting within the first third of this phase. At the transition from stance to swing, the adductors and, in some cases, the hamstring group contracted. During the swing phase only the pre-tibial group was found to be active. Frequently a burst of activity of the gastrocnemius was found in the center of the swing phase. The patterns of electric activity in both legs were identical in the normal.

Patients With Hemiplegia. — In patients with hemiplegia the paretic extremity showed a prolonged swing phase and decreased activity of all muscles

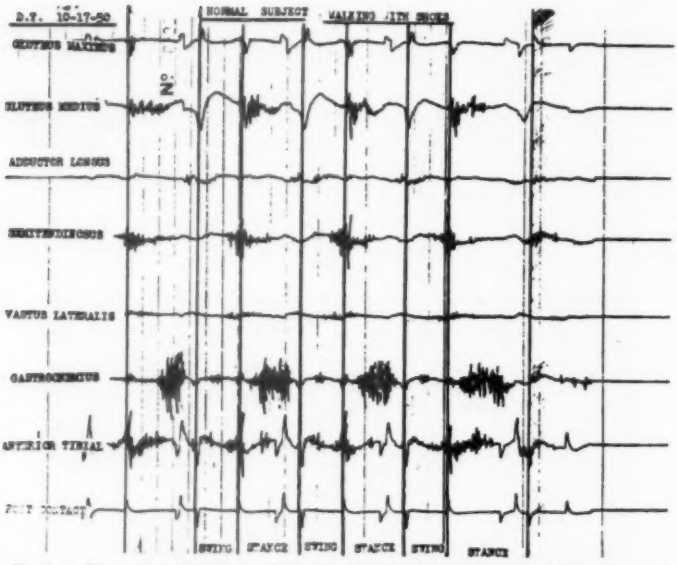

Fig. 3. — Electromyographic pattern of normal gait. — At the transition from swing to stance all muscles contract. During the first third of the stance phase the gluteus medius, gluteus maximus, adductor longus, and semitendinosus are active. The gastrocnemius contracts in the middle of the stance phase. At the transition from stance to swing only the adductor longus is active. During the swing phase the anterior tibial shows variable activity and frequently there is a burst of activity of the gastrocnemius during the middle of the swing phase.

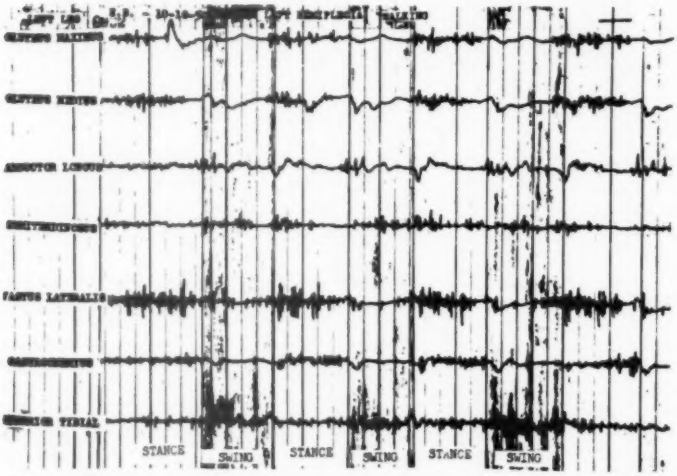

Fig. 4. — Example of electromyographic pattern of the involved lower extremity in a patient with marked hemiparesis showing: 1. Prolonged contraction of the semitendinosus and vastus lateralis during the stance phase. 2. A low amplitude of the contraction of the gastrocnemius. 3. Activity of the gastrocnemius from the end of the swing phase to the end of the stance phase. 4. Generally decreased muscular activity and prolonged swing phase.

(Fig. 4). The most active muscle groups in this extremity were the quadriceps and the hamstrings. Their contraction began at the final portion of the swing phase and lasted until the end of the stance phase. The amplitude of the tracing of the calf muscles was low and uniform. The onset of their contraction coincided with the beginning of the stance phase and the cessation of their activity with the end of this phase. The hip muscles deviated only little from the normal pattern.

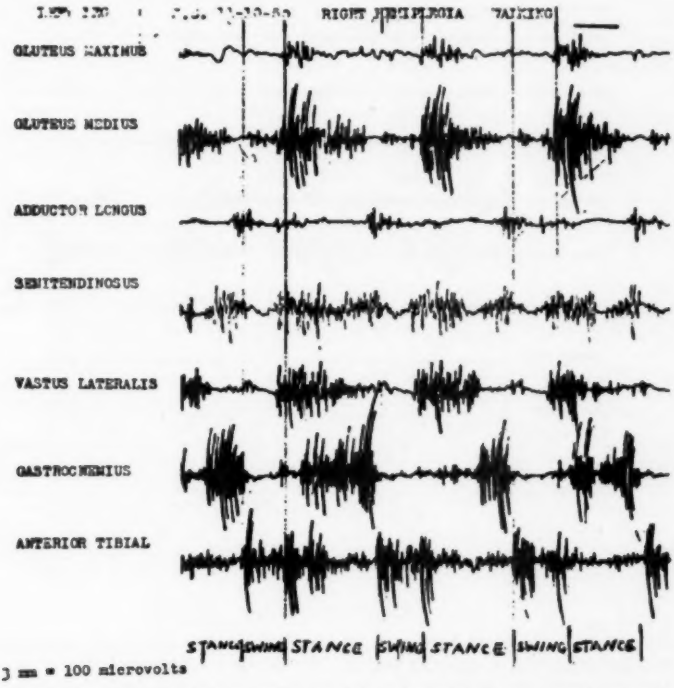

Fig. 5. — Electromyogram of the non-paretic leg of the patient shown in Fig. 4. — This pattern is characterized by: 1. Generally increased muscular activity. 2. Shortened swing phase. 3. Prolonged activity of the semitendinosus and vastus lateralis. 4. Contraction of the gastrocnemius from the end of the swing phase to the end of the stance phase.

The non-paretic limb of the patients with hemiplegia showed a shortened swing phase and increased activity of all muscle groups especially of the gluteus medius (Fig. 5). The timing of electric activity resembled more that of the paretic limb than that of a normal one. For instance, the quadriceps and hamstring groups were active throughout most of the stance phase. Furthermore, the tracing of the calf muscles was uniform in amplitude and began with the stance phase in most instances.

Patients With Spastic Paraparesis. — Unlike the normal subjects and the patients with hemiplegia, the tracings of those with spastic paraparesis showed unpredictable and varied patterns (Fig. 6). There were marked differences not only between one patient and another, but also between the

two limbs of the same patient. However, a given extremity showed a consistent pattern on repeated examinations. Despite the differences in pattern, some characteristics were common to almost all of the tracings, and may be considered typical of the gait in spastic paraparesis. First, the calf muscles contracted only weakly. Secondly, these contractions occupied the entire stance phase. Finally, powerful contractions of the quadriceps and the hamstring muscles were recorded from the latter portion of the swing phase to

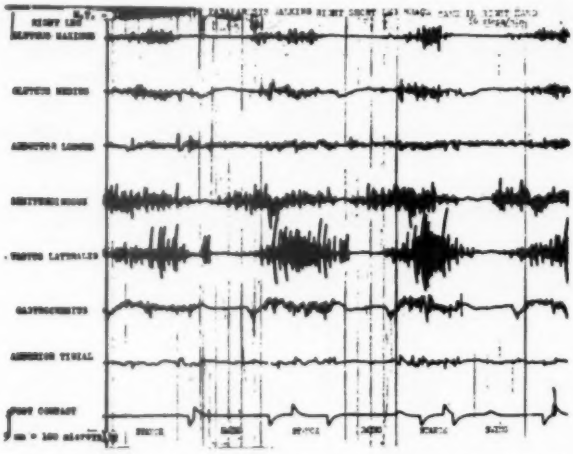

Fig. 6. — Electromyograms of a patient with spastic paraparesis. — In patients with spastic paraparesis, the pattern of muscular contraction is less uniform than that of hemiplegia and normal subjects. However, a prolonged contraction of the semitendinosus and vastus lateralis, and a contraction of the gastrocnemius throughout the whole stance phase are most commonly seen.

the end of the stance phase. These characteristics were noted in over 75 per cent of this group.

Effects of Therapy

Electromyograms were taken prior to and after various forms of therapy. It was found that prolonged periods of exercise produced no change in the patterns of electric activity. Neither did the use of braces and canes produce any significant changes in this pattern, in most instances. In a case of obturator neurectomy for relief from adductor spasm, the postoperative electromyogram showed a marked reduction in adductor activity as compared to the preoperative record. The pattern of the other muscle groups, however, remained unchanged.

Three patients were given intravenous injections of Sodium Amytal[R], and one patient received intravenous Tolserol[R]. No effect upon the pattern of muscular activity could be ascertained. However, the number of cases is insufficient to make a definite statement.

Comment

Our findings in normal subjects are identical with those of other investigators[1] and indicate that there is considerable uniformity in the pattern of muscular activity of the lower extremities during normal gait.

An unexpected finding in the hemiplegic patient was a striking similarity in the pattern of muscular contraction of the non-paretic limb to that of the paretic one. Although this phenomenon may be produced in part by mechanical factors, it is believed that cerebral dysfunction is responsible for the abnormalities found in the non-paretic limb. This concept is further supported by the findings of others. Stroboscopic and force-plate studies of gait[2] showed that the non-paretic limb has curves of vertical load and knee moment similar to those of the paretic limb. Also, Cohn[3] has shown that in patients with hemiparesis there is defective performance of alternating movements in the non-paretic upper limb similar to that of the paretic one. Investigation of the electric activity produced in the quadriceps by stretch of the patellar tendon[4] revealed that the knee jerk in the non-paretic limb was frequently abnormal in patients with hemiparesis.

Another important consideration is the contrast in the intensity of muscular activity between the paretic and non-paretic limbs of the hemiplegic. The decreased amplitude in the tracing of the paretic limb may be due to the actual weakness of the muscles, or to the fact that the patient does not rely on the stability of his paretic limb and therefore does not put any weight on it. The marked muscular activity of the non-paretic extremity shows that this limb supports most of the body weight. It must be emphasized that prior to this study all of the hemiplegic patients had had a course of rehabilitation including resistance exercises to the paretic limb. The fact that they still rely mostly on the non-paretic limb, despite this therapy, suggests that more attention should be paid to the training of the uninvolved side.

The great variability of muscular patterns in the patients with paraparesis might be readily explained by their varied sites of pathology. This may also explain the discrepancy between the two lower extremities which was frequently observed. However, the consistency of pattern of each limb of a given patient on repeated recordings, at varied intervals, is an important finding. It allows us to determine objectively whether or not a therapeutic measure has modified the pattern of muscular activity.

Long periods of exercise, as mentioned above, did not influence the pattern of electric activity, nor did it have any significant effect on the patient's performance. As a rule, the braces and canes did not change the pattern of muscular contraction either. However, at times they produced clinical improvement of the patient's gait. This effect is probably due only to mechanical support, but these appliances do not decrease the spasticity of the extremities as is sometimes believed. Drugs, such as Sodium Amytal® and Tolserol®, did not alter the pattern of muscular activity. Further investigation is in progress with these drugs and others, especially those for which effectiveness in relieving spasticity is claimed. Clinical trials have frequently led to false hopes as to the beneficial effect of drugs on spasticity and, therefore, more objective methods such as the one presented are in order.

Summary

A method of recording muscular activity during the act of walking is presented. The patterns of gait in the normal and in patients with spastic hemiparesis and paraparesis are described and illustrated.

Repeated recordings at various intervals showed a consistent pattern

2. Wortis, S. Bernard; Marks, Morton; Hirschberg, Gerald G., and Nathanson, Morton: Gait Studies in Hemiplegia. Presented before the American Neurological Association (June) 1951. In press for the transactions of the A. N. A.
3. Cohn, R.: Interaction in Bilaterally Simultaneous Voluntary Motor Function, Arch. of Neurol. & Psychiat. 65:472, 1951.
4. Hirschberg, Gerald G., and Bergman, Philip S.: Unpublished data.

in each individual. Uniform and characteristic patterns of muscular activity were found in the normal subjects and in the patients with hemiplegia (both in the paretic and non-paretic lower limbs). This method permits objective evaluation of the effectiveness of therapy aimed at alleviating spasticity.

Preliminary observations of the effects of exercise, braces, and drugs are reported.

Discussion

Dr. Edward M. Krusen, Jr. (Dallas, Texas): I am sure everyone agrees with me in thanking Dr. Hirschberg and his group for a fine piece of work on a most interesting subject of great significance in physical medicine.

The problem of spasticity is one familiar to us all. It is frequently discouraging to see a patient with good muscular strength who is unable to control his muscles because of spasticity. It has been most encouraging for the clinician in physical medicine to note the number of fine papers on this subject in this Congress.

Dr. Hirschberg's paper work with hemiplegic patients appeared particularly significant to me. It is interesting to note that most pronounced changes in electromyographic recordings were in those muscles that are generally most seriously involved in disability.

In this connection I have a question to ask Dr. Hirschberg: I am wondering if he noted a consistent reversal of electromyographic activity of the quadriceps and hamstrings.

It appears to me when I look at these recordings that in the normal individual there is very little activity of the quadriceps and a rather high, although not very prolonged, activity of the hamstring muscle groups in the transition from the swing to the stance phase. On the other hand, a hemiplegic patient appears to have rather marked activity in the quadriceps; and while there is a prolonged activity of the hamstrings, it is not very intense.

The fact that abnormal findings were noted on the uninvolved side would be of great practical significance. It should make us more conscious of the necessity for bilateral training. It also should stress timing, particularly of the stance and swing phase.

Paraparesis of multiple sclerosis is often one of the most discouraging problems in physical medicine practice. It is interesting to note that in Dr. Hirschberg's findings rehabilitation and training did not change the electromyographic patterns. This was noted in spite of the fact that clinical functional improvement is frequently seen. Without doubt the study of the effect of drugs on spasticity is of great clinical importance.

A great deal of difficulty would be avoided if spasticity could be overcome effectively. It is to be hoped that Dr. Hirschberg and his group will continue this valuable study until more effective means of controlling spasticity have been found.

Dr. Gerald G. Hirschberg (New York): I thank Dr. Krusen very much for his kind comments. It is true there is a reversal of hamstring activity, not only in hemiplegics but also in paraplegics.

We have done some purely mechanical studies on hemiplegics, such as force plate studies, to determine the total vertical load, and the knee movement. In those studies we have found that the hemiplegic, for all practical purposes, does not bend his knee when he walks. The hemiplegic walks as if he had a peg leg. This is not only true for the paretic limb, but also for the non-paretic limb.

If the hemiplegic keeps his leg entirely stiff it is understandable that the quadriceps might contract; in fact, I think the powerful contraction of the quadriceps in the hemiplegic gait is rather the cause of the peg leg walking rather than a consequence of it.

In the paraparetics, on the other hand, the greater quadriceps activity is due to the fact that these patients have a slight knee flexion contracture, and walk with bent knees. It requires a great deal of quadriceps action to walk with bent knees to maintain equilibrium.

Dr. Harry Samberg (Des Moines, Ia.): Before asking two questions I would like to preface my remarks with a little discussion.

Those of us who have dealt with hemiplegics and who have tried to consider them intensively, have, in addition to braces, added a heel lift to the uninvolved side. That throws them over more toward the involved side, and gives them better balance.

A second and very important point which I have noticed, and which I think is very often not realized and is omitted in training, is that the first thing that occurs in walking is a forward loss of balance. If you watch many of these hemiplegics you will see they do not seem to roll forward when they walk, but stand more vertically and bring their involved leg forward, which keeps the knee extended.

I would like to ask Dr. Hirschberg whether in their training this has been taken sufficient cognizance of, and whether he has also included a lift on the uninvolved side before the electromyograms were done.

Dr. W. Darley (Denver, Colorado): This is a very interesting presentation of gait. I wonder if the authors have tested or taken gait patterns of normal individuals who were good imitators and who simulated these gaits, to see whether it is a mechanical or a neurological factor.

Dr. W. B. Snow (New York): I would like to ask Dr. Samberg if this is due to the fact that they do not swing their arms. You know, we do not walk only with our feet.

Dr. Gerald G. Hirschberg (New York): We have not tried the heel lift; I think we will. I suppose you realize that this is actually a preliminary study, and we intend to use much more mechanical means.

Dr. Darley's suggestion has been tried. We have used a knee cage to lock the knee. So far we have checked three normal individuals. So far the test is not conclusive. One of them produces a pattern that is fairly similar to the hemiplegic, but the other two produce a pattern that is quite similar to the normal.

FEDERAL CONTROL OF MEDICAL DEVICES *

IRVIN KERLAN, M.D.

Medical Officer, Food and Drug Administration

Federal Security Agency,

WASHINGTON, D. C.

Protection of the consumer against misbranded and adulterated devices is broadly provided by the Federal Food, Drug, and Cosmetic Act which is enforced by the Food and Drug Administration. Two other Federal agencies serve similarly to protect the public. The Federal Trade Commission offers protection against unfair competition and deceptive practices in advertising and the Post Office Department through its Fraud Section takes actions to prevent fraudulent use of the mails. This paper will be devoted to the activities of the Food and Drug Administration as they deal with the labeling of devices.

Although the word "device" does not appear in the designation of the Act, devices share equally with foods, drugs, and cosmetics in the enforcement activities of the administration to promote compliance with statutory requirements. The term "device" as set forth in the Act means instruments, apparatus, and contrivances, including their components, parts, and accessories, intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease in man or other animals or to affect the structure or any function of the body of man or other animals. For practical purposes, except for the declaration of active ingredients, labeling requirements for drugs and devices are the same. A device is misbranded if its labeling is false and misleading in any particular.

The greatest gains in proper labeling of devices have been made by the manufacturers who adhere voluntarily to the statutory requirements. Unfortunately, in the device field there are many improperly branded articles currently being offered for sale by unscrupulous merchandisers and unqualified gadgeteers for use by the public as well as by professional workers. Effective control of such violations requires substantial technical information and cooperation from the scientific groups who have special expert knowledge.

The types of violations which are encountered and proceeded against range from completely worthless therapeutic and diagnostic devices with fantastic health claims to recognized and useful machines for which unwarranted representations are made.

* Presented at the 29th Annual Session, American Congress of Physical Medicine at the Shirley-Savoy Hotel, Denver, Colorado, on September 5, 1951.

The "Plastic Dumbbell"

A representative device of the first class was the basis recently of an involved court action. This unit, which was purported to be based on the latest scientific principles, was popularly referred to as a "plastic dumbbell." It consisted of two plastic water tumblers filled partially with water, sealed with paraffin, joined at their mouths by scotch tape, and set into paraffin in the bottom of plastic baby rattles. It was claimed to introduce into the human body the energy given off by "expanded hydrogen atoms" alleged to be present in the liquid sealed in the tumblers. The user was to hold the article in his hands keeping the feet flatly on the floor without crossing the legs, or while reclining. This, it was claimed, caused the atoms of the body to expand and bring health through the hands. This article, costing $50, was offered to correct obesity and abnormal thinness due to glandular malfunctioning, correct diarrhea and constipation, reverse the aging process, rejuvenate the user, and cure "any disease known to mankind."

Presentation of this case in court necessitated extensive preparation on the part of the Administration, since the burden of proof is on the Government in any action it brings. Physicists were engaged to test the physical properties of the device for its energy output. Persons with diseases diagnosed and treated by physicians who had, on their own, used the device for its curative effects were sought out as well as their personal physicians, who were requested to testify as to their diagnoses in order to establish the lack of clinical value of the device. In addition, recognized experts in medicine were asked to undertake special clinical testing in certain diseases in order to establish further the lack of usefulness of this device.

The jury returned a verdict of guilty against the defendants after a week's trial in Federal district court, during which the physicists presented accurate data showing that the device gave off no measureable energy; the lay users, supported by testimony of their personal physicians, related their experiences as to the ineffectiveness of the device, and the medical experts testified as to the worthlessness of the article.

This case readily demonstrates the extensive preparation which is required generally to establish the worthlessness of a single device which patently is misrepresented. It must be recognized, furthermore that there are many devices still considered violative, in spite of the large number which have already been brought into compliance with the Act.

The Work of the F. D. A.

In reviewing the labeling for a device intended for lay use, it must be kept in mind that representations are not addressed to the medical profession but, in the terms of one court decision, "to the old and young, sick and well" who constitute the general public and are not aware of the limitations of the particular device. It should be stressed that in consideration of any labeling, all related information dealing with the article must be reviewed in order to be certain that amplification and unwarranted significance are not given elsewhere to the claims.

In the consideration of the therapeutic claims, adequate directions for efficacious use of a device are essential unless adequate directions are known by the ordinary individual.

Devices which cannot be used safely or efficaciously without medical supervision, surgical instruments, and devices to be used exclusively by physicians in their professional practice may be exempt from bearing directions for use if they are to be dispensed by physicians and information adequate

for their use is readily available to the physician. In this class would be included devices such as diathermy or ultraviolet lamps other than for tanning. In order to avail himself of the exemptions from adequate directions, the manufacturer must meet additional definite requirements set forth in the regulations.

Adequate warnings are required to safeguard users particularly in pathological conditions or by children where danger to health may arise or against unsafe dosage, method, or duration of administration. In our interest to aid manufacturers we have suggested certain warning statements for several types of devices. For infra-red heating units, we have proposed the warning statement "Do not use over insensitive skin areas or in the presence of poor circulation. The unattended use of infra-red heat by children or incapacitated persons is dangerous." For ultraviolet generators for home use the recommended statement warns "wear protective goggles during use to avoid eye injury. Serious burns may be caused by exposure in excess of recommended dosage. Do not use over skin eruptions except on the advice of your physician." Devices used for massage should bear a warning that the unit should not be used over swollen or inflamed areas, or skin eruptions. We have encountered a number of steam bath or Turkish-bath-type devices for which the following warning is suggested: "Elderly persons and those suffering from heart disease or high blood pressure should not use this device except on the advice of a physician." The fundamental aim of providing such information is to make the article safe for use.

We need information on the hazards that are encountered in the use of devices in order to further the protection to be gained by the safety provisions of the Act. It would be very helpful if instances of injury arising from the use of devices were made known to the Administration, whether or not the directions were followed. The compilation of such information may well indicate that additional warnings should be required to safeguard users of devices. Reports of untoward effects arising from any physical unit employed for its diagnostic or curative properties would be valuable in connection with our device program.

In the field of devices new uses are recommended for those already on the market and these require evaluation. Moreover, new devices are being investigated for the first time. Although the Act does not require any formal application to establish the safety of new devices, such as is prescribed in the case of new drugs, the responsibility of the manufacturer or distributor is equally applicable. Currently the clinical application of ultrasonics is being investigated. Certain devices submitted for import have been released by the Administration with the understanding they are for use only by experts who are qualified by training and experience to investigate the safety of such devices. Only through critical study by well trained scientific workers will it be possible to establish the safety and clinical field of usefulness of these new devices.

To reconsider the problem of appropriate claims for devices, the view cannot be escaped that in the past the indications for use of many devices developed empirically. With the development of scientifically controlled methods of study we should be able to establish the field of use of a device under a particular set of circumstances. Among types of devices for reducing offered to the general user, for example, we encounter rollers, mechanical vibrators, massagers, electric stimulators, plastic suits, and steam baths, among others. Most of these units are claimed to bring about spot reducing, to mold the figure, and to give a new body contour. Such representations are all too frequently seen, and vendors of such equipment hold tenaciously that such body

changes can be brought about. The scientific attitude does not support this expressed view, although the medical literature discloses only a few significant clinical studies to establish the lack of value of these varied modalities.

Outstanding examples of currently encountered fraudulent devices reveal the blatant therapeutic claims made for particular gadgets.

The Electreat

A device which has been the basis of a recent court action ending in the conviction of its manufacturer was called Electreat. This instrument looked like a flashlight with a roller on one end and several attachments which delivered an electric shock to the user. The manufacturer claimed that the apparatus would help arthritis, earache, menstrual disturbances, sleeplessness, nervous disorders, rheumatism, heart attack, and paralysis. After an 8-day trial in Federal court, during which medical experts testified as to the worthlessness of the article for such conditions, the jury found the defendant guilty.

The Magic Spike

Another device which attracted wide publicity because of its unwarranted claims was popularly called the "Magic Spike." Its promotion represented one of the most shameful attempts to cheat the public at the expense of their health which the Administration has brought to the Federal Courts. The "Magic Spike" or Vrilium Tube, the defendants claimed, had radioactive powers that would cure disease when it was worn on the body. Purchasers were using it for cancer, diabetes, leukemia, thyroid disturbances, ulcers, arthritis, and other serious diseases. The gadget is a brass tube two inches long and about as thick as a tally card pencil, with a safety pin attached. It sold for $300. In it is a tiny glass tube filled with barium chloride worth 1/2000 of a cent.

Thirty-five scientific experts testified for the Government to show that the "Magic Spike" was incapable of treating or curing diseases. Most pathetic of the lay-user witnesses was the man who described the death of his diabetic son who abandoned insulin and placed his faith on the "Magic Spike."

In sentencing the defendants Judge LaBuy of Chicago, who heard the case, said "the sale of the device constitutes a gross fraud on the public. You have imposed on the poor sick who in their anxiety for relief would try anything at any price. You have fooled the trusting, the credulous and the gullible. The quackery you have employed is the more despicable because those who were deceived into believing in your fake remedy failed to pursue the treatment proven by medical science to be effective in preventing and curing diseases. The credulous belief in the efficacy of your useless product is the greatest danger inherent in quackery. It discourages and prevents those who use it from seeking proper medical treatment and the results of such neglect are often fatal."

The defendants in this case were each sentenced to a year in jail, fined $1,000, and ordered to pay the cost of the trial which lasted from March 20 to April 6, 1950. The firm also was fined $1,000.

Polizer's "Miracle"

Another contested case dealt with a device known as Polizer, Miracle of the Ages. It consisted of a glass container not unlike a Kjeldahl flask, cemented to a metal cylinder holding a small amount of mercury. This gadget was to be rotated over the diseased part or agitated in water or other liquids taken by the user. It was offered to "normalize" the body against a great

variety of diseases including arthritis, sinusitis, eczema, constipation, hay fever, diabetes, asthma, high blood pressure, low blood pressure and many additional diseases. Again medical experts and outstanding physicists presented scientific testimony to establish the worthlessness of the product. In view of the age and income of the defendant, a fine of only $100 was imposed. Following the Federal action, the State brought a case against the defendant for practicing medicine without a license. This case is now pending.

Cooperation of the American Congress of Physical Medicine

In the development of cases for court presentation, it may become necessary to have tests performed in order to offer substantial evidence. Although we may rightly assume that the claims are invalid, in order to develop the most convincing case, appropriate tests are often needed to demonstrate objectively the lack of value or field of use of a device. The American Congress of Physical Medicine represents the professional group which can properly and most effectively undertake such testing. In the past we have had such professional cooperation. As our regulatory program expands it will depend in a large measure on the working together closely of the experts in physical medicine and the Food and Drug Administration in conducting such tests. Furthermore, as various scientific and pseudo-scientific appliances are investigated by experts in physical medicine it would be of great help to have such data supplied to the Administration.

The Food and Drug Administration has obtained constructive guidance in the evaluation of labeling of devices for several years from the Committee which the American Congress of Physical Medicine has set up to cooperate with the Administration, and has benefited greatly from this assistance. It is to our mutual interest to rid the market of worthless gadgets and to provide truthful labeling for the safe use of devices. While this special group has helped us solve many problems it should be stressed that only with full cooperation of all members of the Congress can the Administration maintain proper labeling for devices in the interest of the public welfare.

Discussion

Mr. Howard Carter (Chicago): The paper by Dr. Kerlan points out the importance of the work of the Food and Drug Administration regarding the control of labeling for medical products which are placed on the market and sold to the public.

Before the present Act was passed by Congress in 1938, control of the marketing of unwarranted and useless devices by governmental bodies was practically nil. It is true that the Bureau of Investigation of the American Medical Association accomplished much by advising the public on the value of nostrums, but the Bureau did not have police power or legal control. Repeated publicity by correspondence and published articles on the part of the Bureau, in many instances, brought about the decline of nostrums and the eventual withdrawal from the market of some of them.

The Administration apparently looks on a "device" as a "drug." The word "device" does not appear in the title of the Act. Whether this interpretation is an elastic use of the word "drug" remains for the future lexicographer to decide.

From the viewpoint of the Council on Physical Medicine and Rehabilitation, the work of the Food and Drug Administration in the control of misbranded quack devices is a great help to the medical profession, enabling the Council to devote its time to clinical problems having more scientific approaches to the treatment of disease.

Dr. Irvin Kerlan (Washington, D. C.): I would like to make one point: Mr. Carter indicated that he questioned whether or not we had authority over devices. What I said was that although in the designation of the Act the word "device" does not appear, it is appropriately defined in the Act and its regulations and all of the law which is written specifically makes reference to "devices."

It so happens that for practical purposes all of the requirements with regard to drugs, except for the new drug provisions and the declaration of active ingredients, are entirely parallel for drugs and devices.

WEAK THUMB OPPOSITION DUE TO POLIOMYELITIS

New Devices to Increase Function

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MINNEAPOLIS, MINNESOTA

It has been estimated that the loss of function of the thumb results in 40 per cent loss of function of the hand.[1] Opposition of the thumb is a highly specialized motion in man.[2] It is performed mainly by the co-ordinated function of the muscles of the thenar eminence, namely: The abductor pollicis brevis, flexor pollicis brevis, opponens pollicis, and adductor pollicis. It should be pointed out that all of these muscles, with the exception of the opponens pollicis, produce flexion at the first metacarpophalangeal joint. Contraction of the opponens pollicis, which is inserted along the radial border of the first metacarpal, produces motion at the carpometacarpal joint pulling the thumb across the hand and rotating the metacarpal in a manner resembling pronation of the forearm.[2-3-4-5-6] Contraction of the flexor pollicis longus adds force and stabilization to the movement. The abductor pollicis longus both abducts and extends at the carpometarcarpal joint;[3] thus, it helps to initiate the act of forcing the thumb into the "grasp" position. However, it alone can not perform this act without the co-ordinated function of the muscles of the thenar eminence. Actually the abductor pollicis brevis is considered the primary abductor.[3] Neither can opposition be done adequately in the absence of the thumb abductors. In voluntary opposition, both the palmaris longus and palmaris brevis tighten the palmar aponeurosis augmenting the movement of the first and fifth metacarpal bones toward each other.[7]

If a poliomyelitis patient has a severely denervated hand, most of these muscle groups will be involved. The thumb will assume a position in which the first carpometacarpal joint will be adducted and extended. If allowed to remain in this position for a prolonged period, as commonly seen in patients confined in a respirator, the thumb adductors, abductor pollicis longus, extensors pollicis longus and brevis and first doral interosseous all become tight. This may cause marked restriction of opposition of the thumb even though there is some return of function to the muscles responsible for this act.

In an effort to solve this problem the "thumb stretcher" (figs. 1 and 2) was designed. Figure 1 shows the material before construction. The sponge-rubber gasket is cut into three sizes: large, medium and small to correspond with approximate hand sizes. A piece of gasket is then rolled up into the shape of a corn cob, and covered with broadcloth. The strips of canvas webbing are then sewed into place. When the need arises the device is fitted to the patient's hand (fig. 2), and the snaps are added. Enough tension

1. Dunn, C. R.: Estimation of Permanent Disability, Minnesota Medicine 21:297 (May) 1938.
2. Bunnell, S.: Opposition of the Thumb, J. Bone & Joint Surg. 20:269 (Apr.) 1938.
3. Hollinshead, W. Henry: Functional Anatomy of the Limbs and Back, Philadelphia, Pennsylvania, W. B. Saunders Company.
4. Gray, Henry: Anatomy of the Human Body, Ed. 23, Philadelphia, Pennsylvania, Lea & Febiger.
5. Grant, J. C. Boileau: Method of Anatomy, Ed. 3, Baltimore, Maryland, The Williams & Wilkins Company.
6. Sobotta, Johannes, and McMurrich, J. Playfair: Atlas of Human Anatomy, V. 1, New York, G. E. Stechert & Company.
7. Brooke, C. R., and Cullinan, J. F.: Resumption of Activity Following Certain Tendon Transfers to the Digits, Arch. Phys. Med. 32:156 (Mar.) 1951.

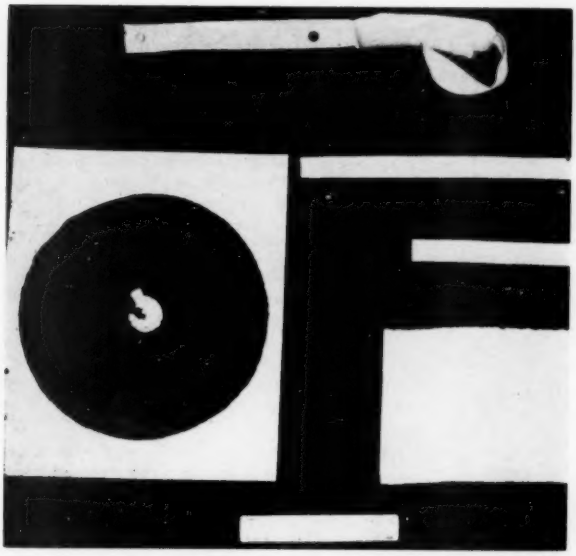

Figure 1. — Material used to make the "thumb stretcher": Left, worn sponge-rubber gasket from a respirator portnole; right, square piece of broadcloth, canvas webbing one inch wide and snap fasteners. Top, finished product.

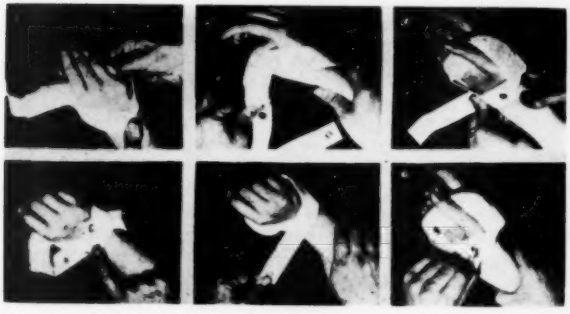

Figure 2. — Application of the "thumb stretcher." 1. The loop of webbing is slipped over the dorsum of the hand with the roll in the palm. 2. The loop of webbing is held in place while the thumb is forced into opposition. 3. The strap of webbing circles the wrist, and 4, is laced through the loop on the dorsum of the hand. 5. The strap is pulled snug. 6. The end of the strap is snapped into place. Recently a snap has been added on the dorsum between the strap and loop of webbing. This prevents the ulnar end of the roll from moving distally out of the palm.

is placed on the webbing to obtain an effective stretch to the webb of the thumb but not enough to cause constriction of circulation in the hand.

Comment

This device has the following desirable features: It is made from inexpensive readily available material. It is simple in construction, easily fitted and applied, stays in place, and is cleaned quickly. If applied early, it prevents undesirable contractures. If applied after contractures are present, it effectively stretches the tight areas. Its usefulness to stretch tight areas can be applied when procedures are contemplated to improve opponens function, such as the use of an opponens splint, a tendon transplant to the thumb[2-8, 9] or a bony fusion in the thumb.

A New Opponens Splint

Many types of opponens splints have been tried by the authors. The undesirable features of these splints are numerous and include such objections as: being complicated, expensive, cumbersome; offering poor support for the thumb with reference to the position in which the thumb is held; preventing free motion at the metacarpophalangeal and carpometacarpal joints; being fragile, difficult to apply and remove, and uncomfortable.

The authors designed an opponens splint (fig. 3) in an effort to eliminate many of these objections. The material is aluminum alloy, and the splint is made from a standard pattern. The only necessary measurement is the distance between the second and fifth metacarpal heads measured on the dorsum of the hand. Another helpful measurement is the maximum distance between the first and second metacarpal heads. The greater this distance the better the function; thus, it is sometimes advisable to stretch tight areas, as mentioned above, for a short period before fitting the splint. The splint may prevent tightness from developing; but it is not designed to perform forceful stretching. The force pulling the thumb into opposition is regulated by tension on the rubber band (fig. 3, No. 4). The hinge placed over the dorsum of the second metacarpal (fig. 3, No. 6), allows the thumb to swing freely into opposition.

Comment

The opponens splint described is simple, inexpensive, light, durable, small; holds the thumb in a functional grasp position; allows free movement at the metacarpophalangeal and carpometacarpal joints; and is easily applied and removed. If fitted properly, it is comfortable to wear.

If the only function remaining in a severely denervated hand is slight finger flexion and that of the flexor pollicis longus, application of this splint will allow many light hand activities that would otherwise be impossible.

Thirty-eight patients having weak opposition of the thumb were fitted with the opponens splint during the period starting February, 1950 and ending May, 1951. Questionnaires were sent to these patients in an effort to evaluate the usefulness of the splint. Twenty-five patients returned their questionnaires answered. Two of these patients had median nerve lesions causing the weakness. The results of this follow-up study are given in table 1.

The period of follow-up of individual patients ranged from two months to fourteen months. Five patients had discontinued wearing their splint. The reasons were as follows: increased strength of the thumb in two patients;

8. Irwin, C. E.: Transplants to the Thumb to Restore Function of Opposition; End Results, South. M.J. 35:257 (Mar.) 1942.
9. Royle, N. D.: An Operation for Paralysis of the Intrinsic Muscles of the Thumb, J. A. M. A. 111:612 (Aug.) 1938.

no return of function in one patient, with a complete median nerve lesion; pain on turning the wheel of the wheel chair was the fourth patient's reason; and a fifth felt it was "too bulky." The period each day for which the patients wore their splints ranged from thirty minutes to sixteen hours. Some patients wore their splints while sleeping. One patient reported that the only time

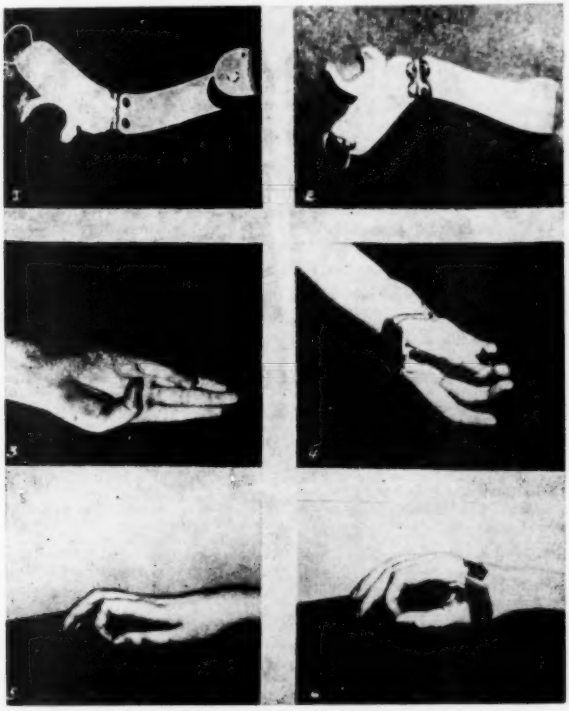

Figure 3. — Opponens splint. 1. Palmar surface. 2. Dorsal surface. 3. Weak opposition. 4. Splint in place. 5. Picking up paper clip without opponens splint. 6. Same act, wearing splint.

the splint was uncomfortable was while he was sleeping. Twenty-two patients reported specific help by using the splint. Fifteen patients reported increased strength of the thumb.

Many hand activities were mentioned by these patients as being enhanced

TABLE 1. — *Use of Opponens Splint.*

Follow Up of 25 Patients.

Average months of follow up	8.24
Still wearing splints	20
Average hours splint worn	5.8
No. reporting any discomfort	9
No. reporting benefit	22
No. reporting increasing strength	15

by wearing the opponens splint and include the following: writing, sewing, buttoning, eating, painting, leather work, knitting, picking up small objects, combing hair, playing piano, peeling potatoes, tying shoes, holding a book, picking up sandwiches, winding a watch, and holding a glass of water. Four activities were mentioned which were hindered by wearing the opponens splint. These include: walking with crutches, rolling own wheelchair, "no place to anchor pencil," gripping heavy objects.

It is the opinion of the authors that many of the complaints of discomfort and hindrance in activities could be alleviated by simple mechanical adjustments to the splint and on-the-spot supervision of activities.

Summary

The functional anatomy of the muscles involved in the act of thumb opposition is described. The disability resulting when these muscle groups are weak is pointed out.

A new device is described that has two purposes: One to maintain the thumb in the functional grasp position if hand weakness indicates the need. Two, if tightness is present in the webb of the thumb, the device effectively stretches the area thus assuring a maximum grasp position of the hand.

A new, simple, inexpensive, light, opponens splint is reported that allows maximum thumb motion while being worn. A follow-up study of twenty-five patients who were fitted with the opponens splint helps substantiate its effectiveness.

Acknowledgements. — The authors wish to thank Mrs. Harriet Dansforth, and other members of the staff of the Elizabeth Kenny Institute, Minneapolis, Minnesota, for their skilled assistance in helping to prepare the material presented. The authors are indebted also to Mr. C. E. Medcalf, Minneapolis, Minnesota, for his help in designing and making the opponens splint.

Discussion

Dr. H. L. Rudolph (Reading, Pennsylvania): May I take a minute to discuss the hand splint which was described in Dr. Worden's excellent paper. I am in accord with the use of any type of splint which can serve to maintain good functional position of the hand. I call your attention to the fact that most polio patients in this country are treated in hospitals which do not have ready access to brace shops and the construction of straps requiring snaps and the like is not as simple as it might seem. For this reason simplicity in splinting encourages splinting when necessary and as often as necessary.

During the past year, Dr. Huddleston described a hand roll which consisted of a cotton-filled piece of stockinette with an encircling piece of elastic tape permitting insertion of all fingers top and the thumb bottom. This has given me an idea for a type of hand roll which anyone can make in several minutes and has been used by us on several occasions with satisfactory maintenance of functional position of the fingers and thumb. As you can see, I am removing my socks. Rolled up in this fashion, and turning back one of the hems to hold the roll, a small bun is formed to fit the palm of the hand. My rolled-up handkerchief and two safety pins to fasten it to the bun complete a satisfactory hand roll for use in the home and even the hospital. With a little more time one could make a neater package.

For most of us who do not have easy access to bracemakers, this simple thing can serve to maintain good functional position of the hand. We have used it to advantage also in the arthritic and the hemiplegic. As you can see, it can hold the thumb in a good functional position.

Dr. Miland E. Knapp (Minneapolis, Minnesota, closing): May I make a remark about this aluminum splint: We developed it by a series of improvements on previous devices, trying to keep them from breaking, and so on, and also trying to get something which could be opened so as to grasp objects. Most of the plastic and metal and leather opponens splints are not so flexible as to allow opening of the grasp; this interferes a great deal with their function.

The thing that I felt indicated the usefulness of this piece of apparatus to the greatest degree was that when one went around and saw the patients, they had them on. When you would say, "How is your opponens splint?" instead of taking it out of a drawer they would just hold up their hand. That meant they were useful and comfortable, and the patients really were using them. Whenever we would ask about the old splints we usually would have to go to the bedside table and take them out of the drawer.

MEDICAL NEWS

Members are invited to send to this office items of news of general interest, for example, those relating to society activities, new hospitals, education, etc. Programs should be received at least three weeks before the date of meeting.

Federation of American Societies for Experimental Biology

At the Statler, New Yorker, McAlpin and Governor Clinton hotels in New York, April 14-18, a meeting of medical research scientists will be held. At this session approximately 5,000 physiologists, biochemists, pharmacologists, pathologists, immunologists and nutritionists will take stock of a year's research. The latest developments in medical science will be reported in approximately 1,600 scientific papers.

The meeting will be a joint conclave of scientific groups representing the basic medical sciences — meeting together under the banner of the Federation of American Societies for Experimental Biology. Most of the Nobel Prize winners in medical science are members of the Federation.

Pennsylvania Academy Meeting

At the March 22nd meeting of the Pennsylvania Academy of Physical Medicine and Rehabilitation, symposiums on arthritis and peripheral vascular disease were presented. The following papers were given: "Treatment of Rheumatic Pain," by Dr. Peter J. Warter; "Orthopedic Management of Arthritis," by Dr. Frederick J. Stiepan. Dr. **Richard T. Smith** discussed the foregoing subjects. "Evaluation of Treatment in Arteriosclerotic Peripheral Vascular Disease," by Dr. **Bror Troedsson,** and "Surgery in the Management of Peripheral Vascular Disease," by Dr. Samuel T. Lloyd were discussed by Dr. **Albert A. Martucci.**

Radioisotope Courses

The Oak Ridge Institute of Nuclear Studies is offering three additional courses in techniques of using radioisotopes in research this summer. Dates are: June 9-July 4; July 7-August 1, and August 11-September 5. Additional information can be obtained by writing to Ralph T. Overman, Chairman, Special Training Division, Oak Ridge Institute of Nuclear Studies, Oak Ridge, Tenn.

New York Society Meets

At the March meeting of the New York Society of Physical Medicine, the following topics were presented: "Physical Properties of Muscle," by Sergei Feitelberg, M. D., discussed by Alexander Sandow, Ph.D., and "Muscle Tester and Foot Exerciser," by William Bierman, M.D.

Kenny Foundation Scholarships

The Sister Elizabeth Kenny Foundation is making free scholarships in Kenny Therapist training available to a limited number of accredited schools of nursing throughout the country, it was announced at national headquarters of the polio Foundation in Minneapolis.

To be eligible, the applicant for the course must be a registered nurse or physical therapist, not over 40 years old. Qualified male nurses or physical therapists are accepted.

Tuition for all courses is paid by the Kenny Foundation. In addition, the Kenny Foundation provides adequate financial assistance on a monthly scholarship basis to permit a comfortable standard of living during training.

Those who wish to apply for the scholarships are invited to contact the Director of Training, Sister Elizabeth Kenny Foundation, 1800 Chicago Avenue, Minneapolis, Minnesota.

Personals

Dr. **A. B. C. Knudson,** Chief of Physical Medicine and Rehabilitation Division, Veterans Administration, recently toured the Kessler Institute, West Orange, N. J.

Howard A. Rusk, New York, N. Y., spoke on "Dynamic Therapeutics in Chronic Disease" at the Michigan Clinical Institute, held in Detroit on March 12-14.

Doctors **George G. Deaver** and **Charles S. Wise** are members of the 11-member Task Force on the Handicapped. After an eight month study, the Task Force filed its report with the Office of Defense Mobilization. The report contains findings of fact and recommendations for making better use of handicapped persons.

Professor Boehm-Munic

Communication has been received from Dr. L. Greber in which he writes: "My friend Professor Boehm-Munic had many friends in America. Perhaps his American friends will be interested in the news of his untimely death. We feel the field of physical medicine has lost one of its most prominent colleagues."

Grant Awarded to University of Wisconsin

The University of Wisconsin Medical School, Madison, has been awarded an $8,110 March of Dimes grant for the study of the effect of certain chemicals on susceptibility to experimental poliomyelitis.

Latin-American Congress of Physical Medicine

The American Congress of Physical Medicine was well represented at the recent meeting in Panama City. The following members participated:

Cassius Lopez de Victoria — Executive Director of Latin-American Congress.

Max K. Newman — "Clinical Applications of Ultra Sound—Observations on Unselected Cases with Musculosketal Disorders."

Ferdinand F. Schwartz — "Physical Medicine and Rehabilitation in Orthopedic Problems and Treatment of Cerebral Palsy."

Glenn E. Drewyer — "Physical Procedures in Rheumatic Arthritis."

O. L. Huddleston— "The Use of Physical Medicine in the Treatment of Anterior Poliomyelitis at the Kabat-Kaiser Institute."

Bills Introduced

Arizona — H.10 — proposes creation of a board of physical therapy examiners and defines physical therapy as treatment of bodily or mental conditions by use of physical, chemical, or other properties of heat, light, water, or electricity, or by massage and active and passive exercise, prescribed by a licensed physician, but does not include the use of roentgen rays and radium for diagnostic and therapeutic purposes or the use of electricity for surgical purposes, including cauterization.

South Carolina — H.1760 — same as above.

New York — A. 2629. — To amend the education law, proposes to authorize school districts to furnish special services, including physiotherapy, occupational therapy, and so forth, to children with cerebral palsy.

Bureau for Handicapped Children

The Health Department of New York City recently announced the creation of a bureau for handicapped children, with Dr. Helen Wallace as Director. More adequate case finding procedures will be developed, as well as the stimulation of research to prevent crippling conditions and a community plan which will enable families in need of this service to find it among the groups helping the handicapped.

National Foundation Awards

A total of $1,775,393 has been awarded to hospitals, medical schools and research institutions by the National Foundation for Infantile Paralysis. Studies will be made on poliomyelitis.

Report on Chronic Disease Available

The National Conference on Chronic Disease has issued its first report entitled, Steps Toward Prevention of Chronic Disease, in booklet form. It is available at a cost of fifty cents. Write to Health Publications Institute, 216 N. Dawson St., Raleigh, North Carolina.

Newly Registered Therapists

February 4, 1952

Asklund, Shirley Carolyn, 8210 Justine St., Chicago 20, Ill.

Banko, Minnie-Dorris, 2610 First Pl., Lubbock, Texas.

Bargion, Pauline Flora, 922 N. Third St., Ishpeming, Mich.

Basford, Phyllis Betty, 1800 Chicago Ave., Minneapolis, Minn.

Bass, Bessie Ray, King St., Halifax, N. C.

Brittle, John Rudolph, 1720 Elmsmere Ave., Richmond, Va.

Buddell, Wilford, 142 W. Windsor, Reading, Pa.

Campbell, Elizabeth Ursula, 31 Claymoss Rd., Brighton, Mass.

Campbell, Mary Elizabeth, 517 Granite Ave., Richmond, Va.

Coryea, Nelson Henry, 1610 Park Ave., Richmond 20, Va.

Coughenour, Sara Jean, 414 Morgantown St., Uniontown, Pa.

Crawford, Regina Baxter, 104 Grove St., Farmville, Va.

Dinerman, Jack, 220 W. Oglethorpe Ave., Savannah, Ga.

Dooley, Marion May, Harrisville, N. Y.

Edwards, Betty Jane, 3326 W. Grace St., Richmond 21, Va.

Farmere, Fred Ansley, 700 W. 4th St., Little Rock, Ark.

Felix, Helen Marjorie, 495 Cooper Ave., Johnstown, Pa.

Frazier, Madell, 1508 Hawthorne, Baytown, Texas.

Gruelle, Everett Leslie, 3024 N. Hegry Circle, Cincinnati 38, Ohio.

Hall, John Luther, 17 Lozier Place, Plattsburg, N. Y.

Hyatt, Clarence John, 2011 H. St., Sparks, Nevada.

Hyde, Robert H., R. D. No. 1, Greenville, Pa.

Kamholtz, Donald Edward, 165 S. Main St., Salamanca, N. Y.

Kantzer, Charles W., 2021 New Jersey, Los Angeles, Cal.

Kline, Ivan Carstater, 83 Ivory St., Frewsburg, N. Y.

Knox, Effie, 1603 Arch St., Little Rock, Ark.

Lisle, Jamie Lou, Hanover, Va.

Logan, Gene Adams, % Mr. Woodrow Logan, 913 Pottowatomie, Leavenworth, Kans.

Love, Joseph Arthur, 186 Audubon Dr., Snyder, N. Y.

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ARCHIVES of PHYSICAL MEDICINE
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.·. EDITORIAL .·.

PHYSICAL MEDICINE AND ATHLETIC INJURIES

In this age of high-powered athletic competition both on an amateur, semi-professional, and professional level, the management of athletic injuries is a subject of considerable importance. It goes without saying that prevention of injury is the keynote of progress. The publications of Thorndike[1] have shown that in a contact sport such as football where the player is subjected to repeated severe mechanical stresses and strains, the incidence of injury may be substantially reduced. For example, during the 5-year period from the fall of 1932 to the spring of 1937, the incidence of knee sprains was 204, whereas from 1937 to 1942 it fell from 204 to 161 and to 58 during the next 5-year period.[2]

The measures necessary include first of all a careful history of possible previous injury, particularly in school athletics. There should be a detailed examination to detect any residual weakness which may lead to recurrences. Proper conditioning prior to actual competitive test is, of course, essential. Successful coaches have learned the importance of this and take a real personal interest in this phase of the development of a team. Proper equipment for the protection of players is an item of universally recognized value.

Even more important, however, is medical supervision of athletes in contact sports to detect minor injuries before they become serious and to insure prompt and adequate therapy of any serious injury. Again in the field of prevention, conditioning exercises for the development of the musculature of the knee and ankle joint is of especial importance, and also the use of protective adhesive strapping to guard against recurrent injuries. This has been well demonstrated by Thorndike in his study of injuries in the Harvard football team. The reduction of the occurrence of ankle and knee injuries is particularly impressive. Over a 10-year period the former dropped from 110 to 40 and the latter from 161 to 61. In another analysis he has reported that in 1937 the average number of exposures without injury, by which is meant one afternoon period of practice or play for each man in the sport, was 33.1, whereas in 1947 it had increased to 53.37. Considering sports by seasons, he found that the highest incidence was in fall sports with a figure of 1,453 as compared with 398 for spring, and 310 for winter.[3] This is due to the higher incidence of injury in body contact sports like football and soccer, although the fall sports were the most highly supervised and organized. In spite of these advances, as everyone knows, athletic injuries are all too common, and their treatment is a matter of considerable importance from many obvious viewpoints including the financial one.

In a recent publication Thorndike has again reviewed the subject of trauma of athletics.[4] In this he has emphasized that the three major body regions most commonly injured in competitive sports are the shoulder, knee

1. Thorndike, Augustus: Athletic Injuries: Prevention, Diagnosis and Treatment. Editions 2 and 3. Philadelphia, Lea & Febiger, 1942 and 1948.
2. Ibid., ed. 3, p. 76.
3. Ibid., ed. 3, p. 62.
4. Thorndike, Augustus: The Trauma of Athletics, New England J. Med. 246:335 (Feb. 28) 1952.

and ankle. He also pointed out the experience of several authors that good coaching and medical supervision has led to very favorable experience in the morbidity of injury from football in secondary schools, and no fatalities in 31 years' experience in the High School League in the City of Boston.[5]

Thorndike's discussion of new developments in the therapy of trauma in the past decade is devoted entirely to advances in physical medicine and rehabilitation. He has mentioned experimental studies on the physiologic effects of new microwave diathermy and stressed its potential dangers and also briefed his readers on the current status of ultrasonics as a physical therapeutic possibility. He has placed especial emphasis on remedial exercise and in particular the technique of strengthening exercises known as progressive resistance exercises which he endorses. Gallagher has also impressively shown the value of progressive resistance exercises in the treatment of athletic injuries of adolescents.[6] Physiologic studies of reaction time have shown that in spite of increasing the power of muscles to a marked degree including hypertrophy, such exercise did not slow up the reaction time as so frequently claimed by coaches and trainers.[7]

This brief review of some current literature suggests that athletic injuries are very frequently encountered and their treatment with procedures in physical medicine is considered of utmost importance. It accordingly seems strange that physicians trained in the specialty of physical medicine have contributed so little to the medical literature on this subject, have not been generally accepted as valuable consultants, and further that the personnel usually employed in actually applying physical therapeutic procedures are not educated in accepted schools of physical therapy in order to understand the pathology of trauma and the physiologic effects of the physical agents employed. This situation has left the door open for the use of a variety of physcial agents for largely psychological effects, particularly when the agent is electrical. It is also of interest to note the great popularity of massage which outranks all other physical procedures.[8] We note also that the term "massage" is sometimes used to actually cover most of the different procedures of physical medicine and it is given credit for recovery of athletes particularly by sports commentators. There is no gainsaying the psychological effect of the laying on of hands, including the professional athlete as the patient, but surely one familiar with modern development of physical medicine would not place it first among the effective physical therapeutic procedures in the treatment of athletic trauma.

All this leads to the conclusion that the physiatrist and the trained physical therapist should have considerable to offer in the field of athletic injuries. The physiatrist should be able to contribute in the diagnosis of neuromuscular injuries through his detailed knowledge of functional muscle tests, and by quantitative analysis of electrical reactions. He is also trained to prescribe optimum methods of restoring neuromuscular function through the use of specific prescriptions for physical medicine. It also seems logical to expect that a well trained physical therapist and graduate of an approved school, particularly men who have previously worked in physical education, should make ideal therapists who could safely and efficiently handle the treatment of injured athletes. The suggestion is made that those physiatrists who do have an opportunity to study the effects of modern physical medicine for treat-

5. Burnett, J. H.: Football Can Be Safe, J. Am. Assn. for Health Phys. Ed. and Recreation **22**: 14, 1951.

6. Gallagher, J. Roswell: Adolescents. Chapter 10, pp. 206-237, in Progressive Resistance Exercise: Technique and Medical Applications, by DeLorme and Watkins. Appleton-Century-Crofts, Inc., New York, 1951.

7. DeLorme, T. L.; Ferris, B. G., and Gallagher, J. R.: Effect of Progressive Resistance Exercise on Muscle Contraction Time, Arch. Phys. Med. **28**:86 (Feb.) 1952.

8. Thorndike, Augustus: Athletic Injuries: Prevention, Diagnosis and Treatment, ed. 3, p. 226. Philadelphia, Lea & Febiger, 1948.

ment of athletic injuries contribute more widely to the medical literature on this subject so that the important role of physical medicine in the treatment of athletic injuries may be more widely accepted.

ANNALS OF PHYSICAL MEDICINE

The ARCHIVES OF PHYSICAL MEDICINE desires to extend to our colleagues in the British Association of Physical Medicine hearty congratulations on the appearance of its new official organ, the *Annals of Physical Medicine*.

This new and excellent journal is edited by Dr. Hugh Burt, assisted by an Editorial Board of eight outstanding physiatrists. The general format and quality of the articles appearing in the first issue indicate that this will be a valuable addition to the literature of our field. The new *Annals of Physical Medicine* will be published quarterly by Headley Brothers, Limited, 109 Kingsway, London, W. C. 2, England. Annual subscription in the United States will be $3.00 and it is urged that physicians interested in physical medicine support this new journal by subscribing to it. The fact that it will be the official organ of the British Association of Physical Medicine, that an outstanding physician like Dr. Hugh Burt is the Editor, and that an excellent Editorial Board will guide its destinies, indicates that this journal will have a promising future which will merit the support of all physicians interested in physical medicine throughout the world. We desire to extend our felicitations to our colleagues in the British Association and to wish them every success with their new journalistic adventure.

BOOK REVIEWS

THE CURE FOR RHEUMATOID ARTHRITIS AND RELATED CONDITIONS (OSTEOARTHRITIS, BURSITIS, FROZEN SHOULDER, ETC.) BY PHYSICAL MEDICINE. A RESULT OF THIRTY YEARS' STUDY. (ORIGINAL INVESTIGATIONS.) By *Joseph Echtman*, M.D., Formerly in Charge Clinic of Physical Medicine, Mount Sinai Hospital, Stuyvesant Polyclinic Hospital; Beth David Hospital; Physician and Lecturer in Physical Medicine, New York Medical College and Flower Fifth Avenue and Metropolitan Hospitals; Physician, Cardiac Clinic, Mount Sinai Hospital, etc. Member American Congress of Physical Medicine, New York Physical Medicine Association, New York Heart Association, American Rheumatism Association, World Medical Association, New York County Medical Association, etc. Cloth. Price, $6.00. Pp. 251, with illustrations. Herald Square Press, Inc., 333 Spring St., New York 13.

Books of this type are usually ignored entirely and not honored with any review, however, because the title includes the words "Physical Medicine," this review is presented for the record.

On one of the preliminary pages this statement is made "The physical therapy methods described in this volume are entirely different from the methods discussed in physical therapy literature or employed in any physical therapy or arthritic clinic. These methods are original, being the result of the author's studies, investigations, observations, trial and error, and wide experience for over thirty years. They offer definite results, and are painless and safe." Then on the following introductory pages, a full page illustration is devoted to three pieces of apparatus with this title—"a long wave (conventional) diathermy, an ultra violet apparatus, and a galvanic sinusoidal (Morse wave) apparatus. They are the only three apparatus that are necessary for the treatment of all the conditions discussed in this volume." How this statement would justify the first statement is obscure.

Chapter I opens with a page devoted to classification. The first is the standard classification followed by another which list six classes of arthritis, namely—"thermal, ultraviolet, salicylate, lithium, magnesium sulfate and iodine."

Chapter II begins with the "Curability of rheumatoid arthritis" in which this statement is made "physical medicine at present is the only method to produce lasting results or a cure of this disease without causing injury." Then a comparison

is made between those accepted methods used today and those which the book proposes. It is stated that "heat, especially diathermy, and also the triad (baking, massage, and exercises) not only have no curative effect and are of no appreciable therapeutic value in rheumatoid arthritis, but are directly harmful"! Then a few paragraphs on the "brutal and harmful" effects of exercises.

The chapter on ionization contains many statements that are certainly questionable and require more confirmation, for example "salicylate ionization should be preferred to all other drugs employed in the ionization methods"; "fibrinogen is the nucleus of the formation of pathologic tissue"; "in gouty arthritis lithium ionization seems to be specific"; and the justification for magnesium sulfate as the "local anesthetic effect on peripheral sensory nerves."

Chapter VII is on the effect of ultraviolet radiation and statements such as these appear — "it (ultraviolet radiation) causes an increase in body resistance by rendering toxins in the body inert"; "death lurks in the erythema when given to the entire body and above all it is generally useless therapeutically"; and considerable discussion about the "miraculous results" with a suberythema technique. The ultraviolet radiation is given "at every *seance*" (italics supplied by the reviewer). According to Webster's new International Dictionary one of the definitions of seance is "a treatment as by electricity or massage." The book refers to massage as being "useless."

Chapter XII covers ankylosing spondylitis and its treatment. A foot note on the first page says this — "The word 'cure' in rheumatoid arthritis is used in this book only in discussing the treatment of the joints of the extremities but not when discussing treatment of rheumatoid spondylitis where the word 'treatment' is used. For the former I have developed methods offering a cure or good results that last for many years, while in the case of the latter no one has as yet achieved methods offering a cure or lasting results." The opening paragraph of the chapter begins "I employed a hand baker, iodo-salicylic ointment and an ultraviolet lamp successfully . . . over a quarter of a century ago, in the treatment of a woman, aged 21, suffering from early rheumatoid (ankylosing) spondylitis . . . after six months treatment, the patient fully recovered and still feels well." If these simple methods produce a remission of "over a quarter a century" when is the word "cure" to be applied? In spite of the success of this case further description of the treatment for spondylitis suggests "long wave (conventional) diathermy followed by my combined ionization and interrupted surging sine wave method," usually referred to as the "IISSWM" method. Although the chapter is labeled "spondylitis," a few remarks are given about gout and practically an entire page on diet in rheumatoid arthritis.

The next chapter considered rheumatic diseases in children. For rheumatic fever ionization with sodium salicylate is recommended during the acute stage and interrupted surging sine wave current "to prevent contractions or cure them if present." The statement is found that "the results obtained from the salicylates and digitalis in the clinic were poor." The diagnosis of rheumatic fever in a child in which permanent joint damages occurs might seriously be questioned. The case of a girl, age 10, who received 200 exposures of ultraviolet radiation and of an adult who received radiation three times a week for two years is cited. The heading of this section of the book is "Pediatric Physical Medicine" and the chapter heading is "Rheumatic Diseases in Children"; however, a lengthy case report is inserted of an adult male with "symptoms of intestinal tuberculosis" who had had surgery for ischio-rectal abscess. This is a further example of the very poor organization of the book.

Part II is on Osteoarthritis. No further comment need be made than this quotation — "apparatus needed to cure osteoarthritis: only two apparatus are necessary: (1) galvanic (sinusoidal) and (2) long wave diathermy."

Part III is labeled "Related Conditions." This begins with bursitis. Excessive use of the personal pronoun "I" and excessive depreciation of all methods except those advocated in the text are undesirable. Several case reports are included which in most of the reports merely mentions the lack of success with other methods and how the techniques outlined in the book were able to produce a "cure."

The next chapter is entitled traumatic arthritis which is covered on one page and is followed by remarks about injured semi-lunar cartilages, joint mice and "useful points in the treatment of diseased joints." For joint mice the treatment is summed up as follows "I have observed that if the offending body is a piece of broken off cartilage, long wave diathermy cures the condition."

Short chapters follow on Heberden's Nodes, Acromioclavicular osteoarthritis and the last one of three pages considers myositis, myalgia and dermatalgia. For the last condition Oudin effluve is suggested and the book ends with this statement from a patient treated with the Oudin effluve — "I have you to thank that I am living today."

If the quotations already given in this review are not sufficient evidence of the ideas the book presents the following ones should be added which are only a few that might be offered: — "the formula of vitamin B resembles that of insulin" then the formula of vitamin B and insulin are given followed by "note that the "S" atom is present in each molecule"; on the use of the Kromayer lamp — "it is usually employed with pressure for the dehematization of the skin"; on the use of ultraviolet radiation — "in cases of mitral insufficiency. Here the murmur usually disappears entirely"; on heat therapy in osteoarthritis which is "indispensable in the chronic stage to cause absorption of the spurs (osteophytes)"; spurs in osteoarthritis "are the only cause of disability"; and "as soon as they are absorbed, a lasting cure is obtained";

"experience has convinced me that long wave diathermy is specific in causing resorption of calcium in joints, capsules of joints, tendons, etc."; "the calcium content of the broken off pieces of cartilage is dissolved by the thermal energy of the long wave diathermy. It becomes soft after a number of treatments, flattens out like a soft piece of wax and causes no more trouble to the patient"; "the ionization with magnesium sulfate causes the tissue to lose alkali, resulting in the relief of pain"; "current (long wave diathermy) causes proportionately more heat in bone and calcium deposits than in muscle and circulating blood"; "he developed a severe cardiac palpitation (over 300 beats per minute) induced by the energy of the short wave diathermy"; on Heberden's Nodes treatment — "ionization with lithium salts followed by the interrupted surging sine wave current is the best treatment and the only one which will actually benefit this disease"; on neuralgic pain — "because of impaired circulation the tissues are not properly nourished and the pain is merely a cry of the tissues for nourishment." And many, many more statements could be cited that need confirmation.

It is difficult to conceive of a more inaccurate, more confused and poorly organized book than this one. It is most unfortunate that the words "Physical Medicine" are included in the title of the book. An injustice is done to the specialty of physical medicine by the implication that physical medicine is able to cure rheumatoid arthritis but more important than that, is the advocacy of physical therapy for reasons and in the manner mentioned in this book. It is hoped that this long review may counteract any inference that methods reported in the book in treating the rheumatic diseases are those usually accepted as physical medicine today.

SPEECH HABILITATION IN CEREBRAL PALSY. By *Marion T. Cass*, Ph.D., Instructor in Speech Science, Columbia University College of Physicians and Surgeons, New York City. Cloth. Price, $3.00. Pp. 212. Columbia University Press, New York; also published by Geoffrey Cumberlege, Oxford University Press, London, Toronto and Bombay.

The author, who has spent a number of years in remedial speech therapy for handicapped children, is eminently well qualified to write a book setting forth methods utilized in speech training for children with cerebral palsy. At present in addition to her teaching responsibilities she is associated with Dr. Winthrop Morgan Phelps of Baltimore who has written a foreword for this book.

She begins by quoting current concepts of the etiology of cerebral palsy, including the various types of anoxia, the sensitivity of the fetus to irradiation, the role of the Rh factor, birth trauma, and use of obstetrical drugs. In a chapter entitled "Motor Reeducational Speech Therapy" she outlines the approach that is used in speech training of the child with cerebral palsy, which actually is quite similar in principle to that used in motor reeducation of the child's other muscles. The methodology of such therapy is discussed clearly and logically, in commendable detail. Each sound that the child must master is taken up in the order of its difficulty and a series of exercises and suggestions are made, including rhymes that utilize the sounds discussed. A useful bibliography is included.

There are a few minor aspects about the book with which some exception might be taken. For example, the author defines cerebral palsy as a "disturbance of muscle function which has its origin in the brain." This would appear to include such non-related conditions as cerebro-vascular accidents with hemiplegia, paralysis agitans, which indeed she calls an "acquired cerebral palsy," and even hysterical paralysis. Also, the reviewer would question the advisability of including a twelve-page summary of the embryologic development and function of the central nervous system which the author quotes from Arey's "Developmental Anatomy." It is unlikely that this section will be easily understood by the average reader.

Despite these minor faults, this book fills an important need and should be read and reread by everyone concerned in the treatment of the child with cerebral palsy.

THE PORPHYRINS AND THEIR RELATION TO DISEASE. PORPHYRIA. By *Cecil James Watson* and *Evrrel Arthur Larson*. Chapter IX-A, Oxford Loose-Leaf Medicine. Paper. Illustrated. Pp. 228 (1) — 228 (59). Vol. IV. 251. Oxford University Press, Inc., 114 Fifth Avenue, New York 11.

Of the new sections in Christian's Oxford Medicine recently received, Chapter IX-A is of particular interest to physiatrists. The subject is The Porphyrins and Their Relation to Disease: Porphyria, by C. J. Watson and E. A. Larson. This is an excellent review of this unusual disease. Photosensitivity to light, fluorescence in near ultraviolet and neurological phenomena concern those in the practice of physical medicine and rehabilitation.

PHYSICAL MEDICINE ABSTRACTS

Importance of Physical Medicine and Rehabilitation for the Industrially Injured. Gordon M. Martin.

J. Michigan M. Soc. 50:730 (July) 1951.

Problems of physical restoration and rehabilitation of individuals injured or handicapped by industrial or occupational accidents should concern everyone. The employee always has either a conscious or an unconscious dread of an occupational accident, and fears its effect on his earning capacity and on the economic security of his family. During the past twenty years, industries and employers have continued to assume greater responsibility for the health of the workers. As a result, rapid strides have been made in prevention of occupational accidents. Also, more comprehensive liability insurance programs have been developed to provide compensation, as well as funds for necessary medical and surgical care. However, facilities for physical medicine, which are essential for final physical restoration and rehabilitation, have been most inadequate. In the report on America's health, a group of authorities on these problems declared: "Physical restoration is the largest missing link in the treatment of the industrially injured." The first-aid treatment now available for the victim of the industrial accident is good. Medical and surgical care as it is provided by the patients' physician or by physicians retained by the employer, and by consulting specialists, is excellent. However, adequate facilities for physical medicine, which provides for physical restoration and rehabilitation during and following definitive medical care, do not exist in most places. Physical therapy, the cornerstone of physical medicine, consists of the use of physical agents including therapeutic exercise, heat, massage and water and electricity for treatment. A large percentage of the most common occupational injuries result in disabilities that deserve thorough well-supervised physical therapy to insure most rapid and complete recovery of maximal function. A survey of the types of industrial injuries indicates that the majority of the disabilities that delay recovery and return to work are the result of injuries that leave residual stiffness of joints, muscular weakness, and poor coordination. These residual effects ordinarily can be minimized by physical therapy and occupational therapy. It would seem that with some increase in medical expenses in order to provide physical medicine and rehabilitation services, the period of disability and compensation can be shortened markedly and the degree of recovery of function increased. Thus with less money needed for compensation, insurance rates could be reduced.

The concept of what constitutes an adequate service in physical medicine and rehabilitation for the industrially injured patient has changed considerably from the concepts of physical therapy which existed ten to twenty years ago. No longer can one consider diathermy or a whirlpool bath, used for twenty to thirty minutes three times weekly, to constitute even basic physical therapy. The aim of the physical medicine and rehabilitation program is to hasten restoration of function of involved parts. Thus: (1) joints must be mobilized or their stiffness reduced; (2) muscular strength must be improved; (3) coordination, speed of movement and endurance must be augmented. In order to accomplish these things, treatment should be started as soon as possible following injury. Details of the treatment should be carefully prescribed by the physician and then should be carefully carried out by a staff of qualified therapists. Several hours daily should be devoted to the physical rehabilitation program of most patients.

The reasons why programs of physical medicine and rehabilitation have been slow in becoming available to the majority of industrially injured patients are these: (1) Owing to the recent evolution of the modern concept of this phase of medical care, many physicians have not had an opportunity to become thoroughly acquainted with the possibilities offered by such a program, to say nothing of becoming familiar with the techniques and procedures, so that they can guide and supervise the physical therapists and other supporting personnel. This deficiency is gradually being overcome, as training courses are being offered to physicians in postgraduate courses and at medical meetings. Also many medical students are taking courses designed to instruct them in such aspects of physical medicine and rehabilitation as can be applied in general practice as well as in many of the specialties.

(2) There is a shortage of qualified physical therapists, so that most departments of physical medicine are not sufficiently staffed. Because of the highly specialized training of the physical therapist, as well as the shortage of available personnel, the cost of hiring enough qualified persons is necessarily high. Therefore, many institutions which could use three to six therapists may be limited to the employment of only a single individual or none at all.

(3) Hospital staffs and hospital boards often fail to see the economic advisability of setting aside space, and of providing personnel for physical medicine and rehabilitation.

(4) The allotments for medical care for the industrially injured which are included in some

of the compensation and insurance plans may provide only limited or inadequate funds for physical medicine and rehabilitation.

(5) Education of the public in regard to the importance of physical medicine and rehabilitation for the treatment of the industrially injured is incomplete. It is hoped that in the relatively near future, the patient with an industrial injury, who now takes for granted the use of the roentgenograms in diagnosis of his injury, can likewise expect to have facilities for physical medicine and rehabilitation utilized for his convalescent care.

The Art of Medicine in the Management of Multiple Sclerosis. Alfred Gallinek.

New York State J. Med. 51:1930 (Aug.) 1951.

In consideration of the unpredictable course of multiple sclerosis, particularly in consideration of the possibility of remissions of very long duration, the diagnosis of multiple sclerosis, with its numerous implications, generally should not be revealed to the patient himself. Although there is no effective therapy and no rationale for such, psychologic common sense requires that the sufferer from multiple sclerosis should be "treated." Although no treatment has definitely been proved to be organically effective in this disease of unknown etiology, almost any treatment may be of great psychologic benefit. According to the classic concept, exercise should be avoided. Recently objections have been raised to this. Putnam even speaks of "vigorous exercise." Gallinek has been impressed by various incidents of abrupt terminations of remissions following immediately after vigorous exercise. Brickner has made similar observations. Gallinek feels that exercise should be avoided and that all efforts in the line of so-called rehabilitation should be guided by this principle. He also believes that remissions occur more frequently after prolonged episodes of rest rather than after periods when the patient tries to keep going. It goes without saying that emotional stress and excitement should be avoided as far as possible.

Fractures of the Upper End of the Humerus. John A. Powers.

South. Med. & Surg. 113:225 (July) 1951.

In considering fractures of the upper end of the humerus, the author has included those which occur at or above the insertion of the latissimus dorsi and the teres major. These fractures have logically been classified according to age. Humeral fractures assume their greatest importance when they occur in children. Injuries to the epiphyseal plate result in growth changes and positional deformities of the humeral head. In adults the treatment of complete fractures of the surgical neck is similar to that in children. However, fractures with adduction of the proximal fragment are about as frequent as those with abduction, the type depending on how the extremity is held when the patient falls. These are treated by immobilization with the arm at the side, as in a Velpeau bandage. In the older patient, where early ambulation and a functioning shoulder outweigh the advantages of an anatomical reduction, treatment is by necessity limited. The arm is placed in a sling or a Velpeau dressing for a minimal period, usually fourteen to twenty-one days, and then active shoulder motion is instituted. Probably no group of fractures demands a more vigorous program of physical therapy than those of the proximal humerus, particularly in the aged. The desire to prevent soft tissue contractures with resultant limitation of motion should remain paramount in the mind of the surgeon. To this end he might sacrifice accurate x-ray repositioning and the freedom from pain that goes with prolonged immobilization.

Physical Medicine in General Practice. Ferdinand F. Schwartz.

J. M. A. Alabama 21:37 (Aug.) 1951.

The employment of physical medicine for the treatment of diseases and injuries has become a very important adjunct in the daily practice of medicine. The most commonly used physical agents in general practice are heat, light, water, ultraviolet rays and exercises. Heat may be applied locally by lamps, short wave, electric pads, moist compresses, paraffin and water. Regardless of which modality is employed, certain basic principles should be observed; namely, the condition of the patient, the pathology involved, age, temperature, distance, time element and sensitivity. Heat must be applied carefully in peripheral vascular diseases and diabetes where the diseased blood vessels cannot take care of the increased circulation. Paraffin baths may be used for home treatments. Contrast baths are useful adjuncts in the management of arthritis at home. In office practice, heat may be employed through short wave diathermy. Care must be observed in spacing the electrodes. Since one cannot estimate the amount of heat to be tolerated by the patient with short wave, the patient should be observed constantly. It is better to give too little than to burn the patient. Ultraviolet rays are invisible and are known as chemical rays. They should never be prescribed carelessly for home use, in spite of the great pressure which is exerted by certain retail outlets. The minimal erythema dose should be ascertained in each individual case and then one-fourth of this amount is given as the initial dose of ultraviolet. The rheumatoid arthritis patient should have rest in order to avoid strain on the joints, and this should be on a non-sagging bed, with the joints in maximum extension. Since deformity takes place in flexion, the extensor muscle groups have to be developed, and exercises must be carefully and accurately prescribed. In addition, to carry the joints through the range of motions, muscle tensing exercises must be prescribed, such as the quadriceps setting exercise. All exercises are to be performed slowly and rhythmically, with complete relaxation in between the exercises. In the acute inflammatory stage,

exercises should not be performed. It is a good policy to start the exercises about two times at one session, repeated every four hours if no pain develops; then gradually add one more daily. Breathing exercises should be a part of the regimen since they promote expansion and ventilation of the thoracic cavity. Detailed basic exercises for rheumatoid arthritis are given. These should be preceded by infra-red light for twenty minutes. After the exercises a gentle rhythmic massage is to be given, using mineral oil and alcohol over the parts. However, massage never should be given over joints. In osteoarthritis, particular attention should be paid to posture, occupation, and obesity, and the walking and sleeping habits of the patient. Heat, in the form of infra-red lamp, baker, or short wave in the office, will relax the muscles. The heat should be followed by massage and postural exercise, especially if the spine is involved. For hemiplegic patients gentle passive exercise is first given to the affected parts. Later active assistive and finally active exercises are to be engaged in. A pulley should be attached to the bed so that the patient may exercise the shoulders and pull himself up to a sitting position. Active exercise to the facial muscles should be instituted by having the patient blow, pucker the lips, close the eyes, open and close the mouth, grind the teeth, and protrude and then withdraw the tongue.

Cross Education: Ipsilateral and Contralateral Effects of Unimanual Training. F. A. Hellebrandt.

J. Applied Physiol. **4**:136 (Aug.) 1951.

The bilateral influence of the unilateral practice of four standardized activities included in the MacQuarrie test of mechanical ability was studied on 50 normal young adult physical therapy trainees, 27 of whom were males. The test was first taken by the preferred and then by the nonpreferred hand. The group was then divided into two on the basis of equivalent hand dominance. Twenty-six subjects practiced once weekly with the left hand and 24 practiced with the right. The experiment extended over a period of 8 weeks at the termination of which right- and left-sided performance was again measured. Statistical analysis of the data supports the following conclusions: (1) Manual dexterity improves significantly with direct practice. (2) In general, the mechanical ability of the dominant limb improved more with direct practice than that of the contralateral extremity. (3) The unpracticed contralateral extremity also improves significantly in mechanical ability. (4) Dextral improvement due to cross education does not approach that achieved by direct practice. (5) The sinistral or non-preferred side may gain more as a result of practice by the contralateral limb than by ipsilateral direct practice but the differences are not significant. (6) The relative amount of motor learning taking place bilaterally appears to spread more nearly equally to the right and the left sides when training involves the less discrete pathways of the non-preferred limb. The mechanism of cross education is discussed. Analysis of the response of normal individuals to volitional exercise suggests that efferent patterns of discharge may take a bilateral course with the major flow going to the contralateral side, and a smaller but identical component traveling ipsilaterally. It is unknown whether this behavioral pattern has its origin in bilateral representation of the musculature in the motor cortex or because ideational motor planning involves a bilateral visualization of the body scheme as a whole.

Physical Medicine and Rehabilitation for Patients with Hemiplegia. L. R. Burnham.

J. Maine M. A. **42**:173 (June) 1951.

The problem of rehabilitation of the hemiplegic is one of the increasingly persistent situations which the physiatrist may expect to encounter. The concept of treatment of this condition has markedly changed during the past decade. This change has been almost entirely along the lines of Physical Medicine Rehabilitation. The general aims of physical medicine rehabilitation treatment are to prevent deformity by maintaining flexibility in soft structures and joints of the affected parts; to aid the patient toward early active use of the paralyzed parts as soon as the functional physiologic processes permit and to give the patient psychic rehabilitation within limits of his cerebral injury. Treatment toward prevention of deformity and ultimate restoration of function should be instituted early. The joints, both those involved in the hemiplegia and those uninvolved, are to be put through the normal range of joint motion in turn, several times daily. In the uninvolved parts, this may be done actively and in the involved parts by passive motion preceded by heat. Spasticity may be reduced by means of hot packs or luminous heat. Spastic muscles should be stretched gently, smoothly, but firmly to overcome tending to contracture. Such stretching should be done after application of heat and light massage. Weak muscles may be exercised by electrical stimulation alternated with underwater exercises. As they increase in strength, resistive exercises may be instituted. The high resistance, low repetitive exercises as outlined by De Lorme will increase strength and as the result is obtained, high repetitive, low resistance, exercises may be used. These latter, while of little value in increasing strength, are of great value for developing endurance. After strength is developed, endurance may follow. Throughout the period of rehabilitation, patients must be made to realize that the outcome of treatment depends largely on themselves. Improvements may continue for months or even a year or more after the onset of the episode. Hemiplegia offers the physiatrist a challenge and will require therapy from all branches of his armamentarium to obtain the maximum results. With the estimate of fifty per cent of such cases being capable of self-care and possibly twenty per cent of these being capable of gainful employment, we have a definite goal to work for with this type of patient.

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MEETINGS OF INTEREST TO THOSE IN THE FIELD OF PHYSICAL MEDICINE AND REHABILITATION

In this column will be published information about meetings of interest to those in the field of physical medicine New data should be sent promptly to the office of the ARCHIVES, 30 North Michigan Avenue, Chicago 2, Illinois.

American Congress of Physical Medicine. — 30th Annual Session, The Roosevelt, New York, New York, August 25, 26, 27, 28, 29, 1952. Walter J. Zeiter, M.D., Chairman, Convention Committee, 30 North Michigan Ave., Chicago 2.

Section on Physical Medicine and Rehabilitation of the American Medical Association. — Tuesday, Wednesday afternoon and Thursday morning of the A. M. A. meeting (June 10, 11 and 12, 1952) in Chicago. Secretary, Walter J. Zeiter, M.D., Cleveland Clinic Foundation, 2020 East 93rd St., Cleveland 6, Ohio.

Chicago Society of Physical Medicine and Rehabilitation. — Meetings, fourth Wedesnday, January through May, 1952. Milton G. Schmitt, M.D., Secretary, 6970 N. Clark Street, Chicago 26.

New York Society of Physical Medicine. — Meetings, first Wednesday. Madge C. L. McGuinness, M.D., Secretary, 48 E. 62nd St., New York 21, N. Y.

The National Society for Crippled Children and Adults, Inc. — 1952 annual convention, Fairmont Hotel, San Francisco, October 26, 27, 28 and 29, 1952. Lawrence J. Linck, Executive Director, 11 South La Salle Street, Chicago 3.

American Occupational Therapy Association. — Annual Convention, August 9-16, 1952, Milwaukee, Wisconsin, Hotel Schroeder. Marjorie Fish, OTR, Executive Director, 33 West 42nd Street, New York 18, N. Y.

American Physical Therapy Association. — Philadelphia, Pennsylvania, Bellevue-Stratford Hotel, June 23,-28, 1952. Mildred Elson, Executive Director, 1790 Broadway, New York 19, N. Y.

International

International Congress of Physical Medicine (1952). London, July 14 to 19, 1952. Applications for the provisional program should be addressed to the Honorary Secretary, Dr. A. C. Boyle, International Congress of Physical Medicine (1952) 45, Lincoln's Inn Fields, London, W.C. 2.

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Medical Department — U. S. Army							
(Address all inquiries to the Office of the Surgeon General, Department of the Army, Washington 25, D. C.)							
Medical Field Service School, Brooke Army Medical Center, San Antonio, Texas	Charles D. Shields, Lt. Col., M.C. Agnes P. Snyder, Major, WMSC	c	49 wks.	Mar.-Sept.	26	None	Certificate
Fitzsimons Army Hospital, Denver	H. B. Luscombe, Col., M.C.	Affiliated with Medical Field Service School					
Letterman Army Hospital, San Francisco, California	Olena M. Cole, Maj., WMSC Raoul C. Psaki, Lt. Col., M.C.	Affiliated with the Medical Field Service School					
Walter Reed Army Hospital, Washington, D. C.	Emma Harr, Maj., WMSC J. H. Kuitert, Lt. Col., M.C.	Affiliated with Medical Field Service School					
Nonfederal	Brunetta Kuehlthau, Maj., WMSC						
Childrens Hospital, Los Angeles*	S. S. Matthews, M.D.	a-b-d	14 mos.	Sept	14	$300	Cert. or Degree
College of Medical Evangelists, Los Angeles*	Mrs. Mary J. Dodge F. B. Moor, M.D.	a-b-c	15 mos.	Sept	16	$300	Cert. or Degree
University of Southern California, Los Angeles*	R. Wm. Berdan C. L. Lowman, M.D.	a-b-d	14 mos.	Sept	16	Univer.	Certificate
University of California School of Medicine, San Francisco*	Charlotte W. Anderson Lucile Eising, M.D.	f d	4 yrs. 12 mos.	FebSept Sept	6 16	Univer. $220[3]	Cert. & Degree Cert. or Degree
Stanford University, Stanford University, Calif.*	Margery L. Wagner W. H. Northway, M.D.	a-d-e	12 mos.	Varies	20	$690	Certificate
University of Colorado Medical Center, Denver*	Lucille Daniels Harold Dinken, M.D.	f a-b-d	4 yrs. 12 mos.	Sept Sept	16 12	$220 qr. $208[3]	Degree Cert. or Degree
Northwestern University Medical School, Chicago	Mary Lawrence E. D. W. Hauser, M.D.	a-b-d	12 mos.	Oct	16	$450	Certificate
State University of Iowa College of Medicine, Iowa City*	Gertrude Beard W. D. Paul, M.D.	e	12 mos.	Sept	20	$200	Certificate
University of Kansas Medical Center, Kansas City, Kan.*	Olive C. Farr D. L. Rose, M.D.	d	12 mos.	FebSept	3	$40[3]	Certificate
Simmons College, Boston	Ruth G. Monteith W. T. Green, M.D.	f a-e	4 yrs. 16 mos.	FebSept Sept	9 24	$40[3] College	Degree Diploma
Boston University College of Physical Education for Women, Sargent College, Cambridge, Mass.	Shirley M. Cogland	f	4½ yrs.	Sept			Degree
Bouve-Boston School in affiliation with Tufts College, Medford, Mass.	Kenneth Christophe, M.D. Adelaide L. McGarrett	c-d-e-f	1-2-4 yrs.	Sept	30	Univer.	Cert. or Degree
University of Minnesota, Minneapolis*	Howard Moore, M.D. Constance K. Greene	f	4 yrs.	Sept	16	$550	Dipl. & Degree
Mayo Clinic, Rochester, Minn.*	F. J. Kottke, M.D. Ruby Green Overmann	c	2 yrs.	Sept	20	$126	Degree
St. Louis University, Division of Health and Hospital Services, St. Louis	E. C. Elkins, M.D. Harry Keown	a-b-c	2 yrs.	Sept	28	$250	Certificate
Washington University School of Medicine, St. Louis*	A. J. Kotkis, M.D. Sister Mary Imelda	f	4 yrs.	JanSept	12	$175 Semes.	Degree
Albany Hospital, Albany, N. Y.	Sedgwick Mead, M.D. Beatrice F. Schulz	c	2 yrs.	Sept	16 6	$450 1st yr.[3] $325 2d yr.[3]	Degree
Columbia University College of Physicians and Surgeons, New York City*	J. W. Ghormley, M.D. Catharine Graham	a-b-d f	12 mos. 4 yrs.	Sept Sept	6	$300 $500	Certificate Degree
New York University School of Education, New York City*	W. B. Snow, M.D. Floy L. Pinkerton	a-c-e	1-2 yrs.	Sept	50	$680 (1 yr.) $1,200 (2 yrs.)	Cert. or Degree
Duke University, Durham, N. C.*	G. G. Deaver, M.D. Elizabeth C. Addoms	a (+1 yr. coll.) b-d	12 mos.	Sept	40	$760	Cert. & Degree
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Divimon of Physical Therapy of the School of Auxiliary Medical Services of the University of Pennsylvania, Philadelphia*	Jessie Wright, M.D. Kathryn Kelley	a-b-d	12 mos.	Oct	25	$300	Diploma
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Hermann Hospital, Houston, Texas*	G. W. N. Eggers, M.D. Ruby Decker	a-b-d	12 mos.	Jan	8	$149[3]	Cert. or Degree
Baruch Center of Physical Medicine and Rehabilitation, Medical College of Virginia, Richmond*	O. O. Selke, Jr., M.D. Mary Elizabeth Kolb	a-b-d	12 mos.	Oct	15	$300	Certificate
University of Wisconsin Medical School, Madison*	W. J. Lee, M.D. Susanne Hirt H. D. Bouman, M.D. Margaret A. Kohli	a-b-d f a-b-d f	12 mos. 4 yrs. 12 mos. 4 yrs.	Sept Sept Sept FebSept	52 22 20	$300[3] $60 Semes.[2]	Diploma Degree Certificate Cert. & Degree

** Reprinted in part J. A. M. A. 146:197 (May 12) 1951.

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10:15-11:00 a.m.	Basic Surgery, Upper Extremity
11:15-12:00 a.m.	Prostheses, Upper Extremity
12:00- 1:00 p.m.	Luncheon
1:15- 2:00 p.m.	Cineplasty and Cineplastic Prostheses
2:15- 3:00 p.m.	Training Technics
3:15- 4:30 p.m.	Clinic for Arm Amputees
8:00- 9:00 p.m.	Films

Friday, May 2 Lower Extremity

9:00-10:00 a.m.	Basic Surgery, Lower Extremity
10:15-11:00 a.m.	Preprosthetic Care: Bed Posture, Bandaging, Exercises
11:15-12:00 a.m.	Prostheses for Lower Extremity: Material, Fit, Alignment
12:00- 1:15 p.m.	Luncheon
1:15- 2:00 p.m.	Prosthesis: Anatomical Considerations in the Fitting of B.K. and A.K. Legs
2:15- 3:00 p.m.	Training Technics
3:00- 4:30 p.m.	Clinic for Leg Amputees
8:00- 9:30 p.m.	Group Discussion

Saturday, May 3 Congenital Amputations

9:00-10:00 a.m.	Orientation
10:15-11:00 a.m.	Lower Extremity
11:15-12:00 a.m.	Upper Extremity
12:00- 1:15 p.m.	Luncheon
1:15- 2:00 p.m.	Films
2:15- 4:30 p.m.	Clinic for Congenital Amputees

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Physical Therapy and Occupational Therapy in the Care of Poliomyelitis

This course is open to graduates of approved schools in physical therapy and occupational therapy. Such graduates must be members of the American Physical Therapy Association and /or the American Registry of Physical Therapists and Occupational Therapy Association.

Tuition: None. For Scholarship to Cover Transportation and Maintenance, Contact National Foundation for Infantile Paralysis, 120 Broadway, New York 5, New York.

Entrance Dates: First Monday in January, April, July and October.

Duration of Course: The Course is divided into two parts:

Part I. Over-all care of convalescent polio with particular emphasis and special training in muscle testing and muscle reeducation.

Part II. Particular emphasis and special training in functional testing and functional retraining.

Each Part lasts three months and only selected students who have completed Part I will be admitted to Part II. All students applying for Part I must be willing to remain through Part II if selected.

For Information Write:

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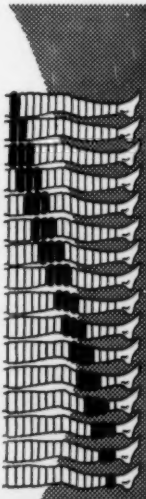

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AMERICAN PHYSICAL THERAPY ASSOCIATION

June 23-28, 1952

Bellevue-Stratford Hotel, Philadelphia, Pennsylvania

PROGRAM

(June 18-20, Executive Committee Meetings)

Saturday, June 21st	
all day	**School Section**
June 22nd	
2:00- 5:00	**House of Delegates**
June 23rd	
all day	**House of Delegates**
4:00- 6:00	**"Mug-up"** — Pennsylvania Chapter, Inc., Hostess
8:00	**Opening Session** Speakers to be announced
June 24th	
9:30-12:00	**Symposium — Hand Injuries** Lt. Col. Richard H. B. Dear, Chief, Physical Medicine, Valley Forge Army Hospital, and staff members
2:00- 5:00	**Symposium on Industrial Accident Disabilities** Moderator, William A. Tomasco, M.D. Participants to be announecd
2:00- 5:00	**Pediatric Seminar** Participants to be announecd
7:30	Movies
June 25th	
9:30-12:00	**Symposium on Neurological Conditions** Moderator, Joseph C. Yaskin, M.D. Participants to be announced
9:30-12:00	**Electrotherapy** — Panel Discussion George Morris Piersol, M.D. Other participants to be announced
3:00- 5:00	**Standing Committee Meetings** Chapter Chairmen and National Chairmen
7:30	Annual banquet
June 26th	
9:30-12:00	**Reflex Patterns of Movement** Moderator, Julius H. Comroe, Jr., M.D. Participants, Frances Hellebrandt, M.D. Herman Kabat, M.D.
2:00- 4:30	**Research Papers** Moderator, Frances Hellebrandt, M.D.
2:00- 4:30	Movies
June 27th and 28th	
all day Friday & Saturday morning	**Instructional Courses** **Electrical Investigation** Mary Elizabeth Kolb, Chief Instructor **Reflex Patterns of Movement** Margaret Knott, Chief Instructor **Analysis of Gaits** Signe Brunnstrom, Chief Instructor **Functional Anatomy** To be announced

AMERICAN CONGRESS OF PHYSICAL MEDICINE

SPRING SESSION

EASTERN SECTION

In Conjunction with the New England Society of Physical Medicine, the Section on Physical Medicine of the Medical Society of the County of Kings, the New Jersey Society of Physical Medicine, the New York Society of Physical Medicine, the Pennsylvania Academy of Physical Medicine and the Society of Physical Medicine of the District of Columbia.

SATURDAY, May 3, 1952

State Veterans Home and Hospital and Hospital for Chronic Illness
Rocky Hill, Connecticut

MORNING SESSION — 10:30 A.M.
LUNCH — HOSPITAL — 11:30 A.M.
AFTERNOON SESSION — 1-5 P.M.

SOCIAL HOUR — HARTFORD CLUB — 6:30 P.M.
DINNER — HARTFORD CLUB — 7:15 P.M.

MORNING SESSION

Visit to the Department of Physical Medicine and Rehabilitation, State Veterans Home and Hospital and Hospital for Chronic Illness, and Special Demonstrations.

AFTERNOON SESSION

1. **Evaluation Clinic, Department of Physical Medicine and Rehabilitation, Hospital for Chronic Illness.**
2. **Medicolegal Aspects of Industrial Injuries** — SAMUEL SHERMAN, M.D., Director of Physical Medicine and Rehabilitation, Montefiore Hospital, Pittsburgh, Pennsylvania. Washington Area Consultant in Physical Medicine and Rehabilitation, Veterans Administration.
   Discussion: Nicholas Mauriello, M.D., Wilkes-Barre, Pennsylvania.
3. **The Scapulo-Humeral Angle — An Aid in the Diagnosis and Prognosis of the Stiff and Painful Shoulder** — HAROLD LEFKOE, M.A., M.D., A.I.C.S., Orthopedic Surgeon, Einstein Medical Center and at St. Joseph's Hospital; Assistant, Department of Physical Medicine and Rehabilitation, Philadelphia General Hospital.
   Discussion: Walter F. Jennings, M.D., Hartford, Conn.
4. **Mechanics of the Feet** — ALLEN S. RUSSEK, M.D., Assistant Professor of Physical Medicine and Rehabilitation, New York University College of Medicine; Director of Out-Patient Service, Institute of Physical Medicine and Rehabilitation, New York City.
   Discussion: Jessie Wright, M.D., Pittsburgh, Pennsylvania.

INTERMISSION

AFTERNOON SESSION (Continued)

5. **The Physical Aspects of Radiation** — LEWIS DICKAR, M.D., Attending Physician, Department of Physical Medicine and Rehabilitation, Kings County Hospital, Brooklyn, N. Y.; Director of Physical Medicine, Maimonides Hospital, Brooklyn, N. Y.
   Discussion: William H. Schmidt, M.D., Jefferson Hospital, Philadelphia, Penn.
6. **Ultrasonic Therapy** — H. J. BEHREND, M.D., Associate in Physical Medicine, Hospital for Joint Diseases, New York City; Director of Physical Medicine, Beth Abraham Home, New York City; President, New York Society of Physical Medicine.
   Discussion: Fritz Friedland, M.D., Cushing VA Hospital, Framingham, Mass.
7. **Serum Neuritis** — ARTHUR L. WATKINS, M.D., Assistant Clinical Professor of Medicine, Harvard Medical School; Chief of Physical Medicine, Massachusetts General Hospital; Medical Director, Bay State Medical Rehabilitation Clinic, Boston, Massachusetts.
   Discussion: James C. Fox, Jr., M.D., Hartford, Conn.

Evening Session

Social Hour at The Hartford Club — 6:30 P.M.
Dinner at The Hartford Club — 7:15 P.M.
Entertainment — Patients from New Britain Memorial Hospital, Commission for the Chronically Ill, Aged and Infirm.
Rehabilitation Program
What Is New With the Korean Casualty — LIEUT. COL. JOHN H. KUITERT, M.C., Chief, Physical Medicine Services, Army Medical Center, Walter Reed General Hospital, Washington, D. C.

Physicians, Other Professional Personnel and Their Guests Are Welcome.

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Nils K. Covalt, M.D.,
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Rocky Hill, Conn.

H. Bruno Arnold, M.D.,
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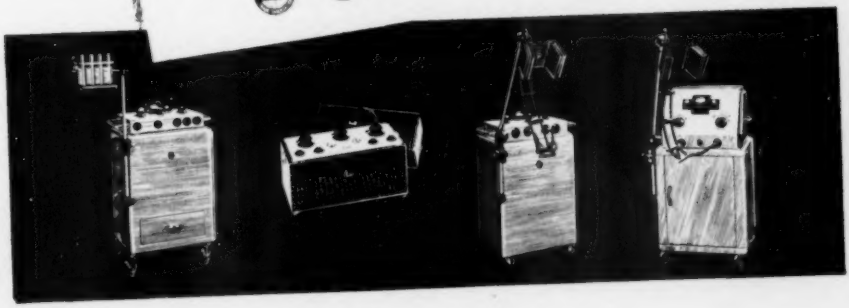
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